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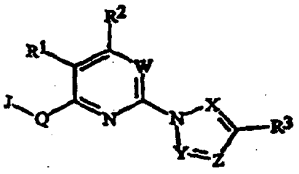
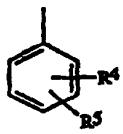


(I)



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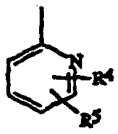

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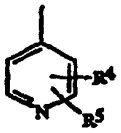

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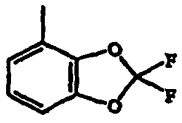

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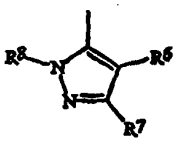

(J-5)

(57) Abstract

Compounds of Formula (I) and their *N*–oxides and agriculturally suitable salts, are disclosed which are useful for controlling undesired vegetation wherein J is (J–1), (J–2), (J–3), (J–4) or (J–5) and Q, W, X, Y, Z, and R^1 through R^8 are as defined in the disclosure. Also disclosed are compositions containing the compounds of Formula (I) and a method for controlling undesired vegetation which involves contacting the vegetation or its environment with an effective amount of a compound of Formula (I).

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TITLE

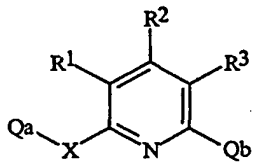
HETEROARYL AZOLE HERBICIDES

BACKGROUND OF THE INVENTION

This invention relates to certain heteroaryl azoles, their *N*-oxides, agriculturally suitable salts, compositions thereof, and methods of their use for controlling undesirable vegetation.

The control of undesired vegetation is extremely important in achieving high crop efficiency. Achievement of selective control of the growth of weeds especially in such useful crops as rice, soybean, sugar beet, corn (maize), potato, wheat, barley, tomato and plantation crops, among others, is very desirable. Unchecked weed growth in such useful crops can cause significant reduction in productivity and thereby result in increased costs to the consumer. The control of undesired vegetation in noncrop areas is also important. Many products are commercially available for these purposes, but the need continues for new compounds which are more effective, less costly, less toxic, environmentally safer or have different modes of action.

WO 96/06096 discloses herbicidal substituted pyridines of the formula



wherein, *inter alia*,

R^1, R^2, and R^3 are each independently hydrogen, alkyl, alkoxy, cyano, nitro or halogen;

Qa is optionally substituted phenyl, pyrazolyl or pyridyl;

Qb is azolyl;

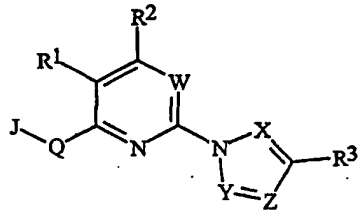
X is O, S or NR^4; and

R^4 is H or alkyl.

The heteroaryl azoles of the present invention are not disclosed in this publication.

SUMMARY OF THE INVENTION

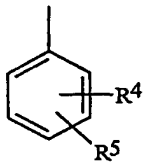
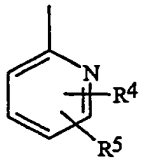
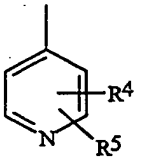
This invention is directed to compounds of Formula I including all geometric and stereoisomers, *N*-oxides, and agriculturally suitable salts thereof, as well as agricultural compositions containing them and a method of their use for controlling undesirable vegetation:



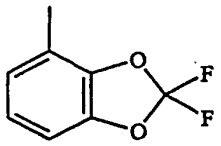
I

wherein

J is

J-1 J-2 J-3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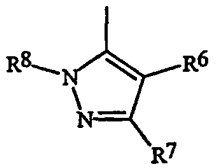

;

J-4 J-5

W is N or CR^9;

X, Y and Z are independently N, CH or CR^9, provided that only one of X, Y and Z is CR^9;

Q is O, $S(O)_n$ or NR^{10};

R^1 and R^2 are independently H, halogen, cyano, C_1-C_4 alkoxy, C_1-C_4 haloalkoxy, C_2-C_4 alkoxyalkyl, C_3-C_5 dialkoxyalkyl, C_1-C_4 alkyl, C_1-C_4 haloalkyl, C_2-C_4 alkoxyalkyl, C_3-C_4 alkenyl, C_3-C_4 alkynyl, C_3-C_4 alkenyloxy, C_3-C_4 alkynyloxy, $S(O)_nR^8$, C_2-C_4 alkylthioalkyl, C_2-C_4 alkylsulfonylalkyl, C_1-C_4 alkylamino or C_2-C_4 dialkylamino;

R^3 is H, halogen, cyano, C_1-C_4 alkoxy, C_1-C_4 haloalkoxy, C_1-C_4 haloalkyl, C_2-C_4 alkoxyalkyl, C_3-C_4 alkenyl, C_3-C_4 alkynyl, C_3-C_4 alkenyloxy, C_3-C_4 alkynyloxy or $S(O)_nR^8$;

R^4 is halogen, cyano, SF_5, C_1-C_4 haloalkyl, C_1-C_4 alkoxy, C_1-C_4 haloalkoxy or $S(O)_nR^8$;

R^5 is H, halogen, cyano, SF_5, C_1-C_4 haloalkyl, C_1-C_4 alkoxy, C_1-C_4 haloalkoxy or $S(O)_nR^8$;

R^6 is H, halogen, cyano, SF_5, C_1-C_4 haloalkyl, C_1-C_4 alkoxy, C_1-C_4 haloalkoxy or $S(O)_nR^8$;

R^7 is halogen, cyano, SF_5, C_1-C_4 haloalkyl, C_1-C_4 alkoxy, C_1-C_4 haloalkoxy or $S(O)_nR^8$;

each R^8 is independently C_1-C_4 alkyl or C_1-C_4 haloalkyl;

each R^9 is independently halogen, cyano, C_1-C_4 alkoxy, C_1-C_4 haloalkoxy, C_1-C_4 alkyl, C_1-C_4 haloalkyl, C_2-C_4 alkoxyalkyl, C_3-C_4 alkenyl, C_3-C_4 alkynyl, C_3-C_4 alkenyloxy, C_3-C_4 alkynyloxy or $S(O)_nR^8$;

R^{10} is H, C_1-C_4 alkyl or C_1-C_4 haloalkyl; and

each n is independently 0, 1 or 2.

In the above recitations, the term "alkyl", used either alone or in compound words such as "alkylthio" or "haloalkyl" includes straight-chain or branched alkyl, such as, methyl, ethyl, *n*-propyl, *i*-propyl, or the different butyl, pentyl or hexyl isomers. The term "1-2 alkyl" indicates that one or two of the available positions for that substituent may be alkyl which are independently selected. "Alkenyl" includes straight-chain or branched alkenes such as ethenyl, 1-propenyl, 2-propenyl, and the different butenyl, pentenyl and hexenyl isomers. "Alkenyl" also includes polyenes such as 1,2-propadienyl and 2,4-hexadienyl. "Alkynyl" includes straight-chain or branched alkynes such as ethynyl, 1-propynyl, 2-propynyl and the different butynyl, pentynyl and hexynyl isomers. "Alkynyl" can also include moieties comprised of multiple triple bonds such as 2,5-hexadiynyl. "Alkoxy" includes, for example, methoxy, ethoxy, *n*-propyloxy, isopropyloxy and the different butoxy, pentoxy and hexyloxy isomers. "Alkoxyalkyl" denotes alkoxy substitution on alkyl. Examples of "alkoxyalkyl" include CH_3OCH_2, $CH_3OCH_2CH_2$, $CH_3CH_2OCH_2$, $CH_3CH_2CH_2CH_2OCH_2$ and $CH_3CH_2OCH_2CH_2$. "Alkenyloxy" includes straight-chain or branched alkenyloxy moieties. Examples of "alkenyloxy" include $H_2C{=}CHCH_2O$, $(CH_3)_2C{=}CHCH_2O$, $(CH_3)CH{=}CHCH_2O$, $(CH_3)CH{=}C(CH_3)CH_2O$ and $CH_2{=}CHCH_2CH_2O$. "Alkynyloxy" includes straight-chain or branched alkynyloxy moieties. Examples of "alkynyloxy" include $HC{\equiv}CCH_2O$, $CH_3C{\equiv}CCH_2O$ and $CH_3C{\equiv}CCH_2CH_2O$. "Alkylthio" includes branched or straight-chain alkylthio moieties such as methylthio, ethylthio, and the different propylthio, butylthio, pentylthio and hexylthio isomers. "Alkylthioalkyl" denotes alkylthio substitution on alkyl. Examples of "alkylthioalkyl" include CH_3SCH_2, $CH_3SCH_2CH_2$, $CH_3CH_2SCH_2$, $CH_3CH_2CH_2CH_2SCH_2$ and $CH_3CH_2SCH_2CH_2$. "Alkylthioalkoxy" denotes alkylthio substitution on alkoxy. "Alkylsulfinyl" includes both enantiomers of an alkylsulfinyl group. Examples of "alkylsulfinyl" include $CH_3S(O)$, $CH_3CH_2S(O)$, $CH_3CH_2CH_2S(O)$, $(CH_3)_2CHS(O)$ and the different butylsulfinyl, pentylsulfinyl and hexylsulfinyl isomers. Examples of "alkylsulfonyl" include $CH_3S(O)_2$, $CH_3CH_2S(O)_2$, $CH_3CH_2CH_2S(O)_2$,

$(CH_3)_2CHS(O)_2$ and the different butylsulfonyl, pentylsulfonyl and hexylsulfonyl isomers. "Cyanoalkyl" denotes an alkyl group substituted with one cyano group. Examples of "cyanoalkyl" include $NCCH_2$, $NCCH_2CH_2$ and $CH_3CH(CN)CH_2$. "Alkylamino", "dialkylamino", "alkenylthio", "alkenylsulfinyl", "alkenylsulfonyl", "alkynylthio", "alkynylsulfinyl", "alkynylsulfonyl", and the like, are defined analogously to the above examples.

One skilled in the art will appreciate that not all nitrogen containing heterocycles can form *N*-oxides since the nitrogen requires an available lone pair for oxidation to the oxide; one skilled in the art will recognize those nitrogen containing heterocycles which can form *N*-oxides. One skilled in the art will also recognize that tertiary amines can form *N*-oxides. Synthetic methods for the preparation of *N*-oxides of heterocycles and tertiary amines are very well known by one skilled in the art including the oxidation of heterocycles and tertiary amines with peroxy acids such as peracetic and *m*-chloroperbenzoic acid (MCPBA), hydrogen peroxide, alkyl hydroperoxides such as *t*-butyl hydroperoxide, sodium perborate, and dioxiranes such as dimethyldioxirane. These methods for the preparation of *N*-oxides have been extensively described and reviewed in the literature, see for example: T. L. Gilchrist in *Comprehensive Organic Synthesis*, vol. 7, pp 748-750, S. V. Ley, Ed., Pergamon Press; M. Tisler and B. Stanovnik in *Comprehensive Heterocyclic Chemistry*, vol. 3, pp 18-20, A. J. Boulton and A. McKillop, Eds., Pergamon Press; M. R. Grimmett and B. R. T. Keene in *Advances in Heterocyclic Chemistry*, vol. 43, pp 149-161, A. R. Katritzky, Ed., Academic Press; M. Tisler and B. Stanovnik in *Advances in Heterocyclic Chemistry*, vol. 9, pp 285-291, A. R. Katritzky and A. J. Boulton, Eds., Academic Press; and G. W. H. Cheeseman and E. S. G. Werstiuk in *Advances in Heterocyclic Chemistry*, vol. 22, pp 390-392, A. R. Katritzky and A. J. Boulton, Eds., Academic Press.

The term "halogen", either alone or in compound words such as "haloalkyl", includes fluorine, chlorine, bromine or iodine. The term "1-2 halogen" indicates that one or two of the available positions for that substituent may be halogen which are independently selected. Further, when used in compound words such as "haloalkyl", said alkyl may be partially or fully substituted with halogen atoms which may be the same or different. Examples of "haloalkyl" include F_3C, $ClCH_2$, CF_3CH_2 and CF_3CCl_2. The terms "haloalkenyl", "haloalkynyl", "haloalkoxy", "haloalkylthio", and the like, are defined analogously to the term "haloalkyl". Examples of "haloalkenyl" include $(Cl)_2C=CHCH_2$ and $CF_3CH_2CH=CHCH_2$. Examples of "haloalkynyl" include $HC\equiv CCHCl$, $CF_3C\equiv C$, $CCl_3C\equiv C$ and $FCH_2C\equiv CCH_2$. Examples of "haloalkoxy" include CF_3O, CCl_3CH_2O, $HCF_2CH_2CH_2O$ and CF_3CH_2O. Examples of "haloalkylthio" include CCl_3S, CF_3S, CCl_3CH_2S and $ClCH_2CH_2CH_2S$. Examples of "haloalkylsulfinyl" include $CF_3S(O)$, $CCl_3S(O)$, $CF_3CH_2S(O)$ and $CF_3CF_2S(O)$. Examples of "haloalkylsulfonyl" include $CF_3S(O)_2$, $CCl_3S(O)_2$, $CF_3CH_2S(O)_2$ and $CF_3CF_2S(O)_2$. Examples of "haloalkoxyalkoxy" include

CF_3OCH_2O, $ClCH_2CH_2OCH_2CH_2O$, $Cl_3CCH_2OCH_2O$ as well as branched alkyl derivatives.

The total number of carbon atoms in a substituent group is indicated by the "C_i-C_j" prefix where i and j are numbers from 1 to 5. For example, C_1-C_3 alkylsulfonyl designates methylsulfonyl through propylsulfonyl; C_2 alkoxyalkyl designates CH_3OCH_2; C_3 alkoxyalkyl designates, for example, $CH_3CH(OCH_3)$, $CH_3OCH_2CH_2$ or $CH_3CH_2OCH_2$; and C_4 alkoxyalkyl designates the various isomers of an alkyl group substituted with an alkoxy group containing a total of four carbon atoms, examples including $CH_3CH_2CH_2OCH_2$ and $CH_3CH_2OCH_2CH_2$. Examples of "alkylcarbonyl" include $C(O)CH_3$, $C(O)CH_2CH_2CH_3$ and $C(O)CH(CH_3)_2$. Examples of "alkoxycarbonyl" include $CH_3OC(=O)$, $CH_3CH_2OC(=O)$, $CH_3CH_2CH_2OC(=O)$, $(CH_3)_2CHOC(=O)$ and the different butoxy- or pentoxycarbonyl isomers. In the above recitations, when a compound of Formula I is comprised of one or more heterocyclic rings, all substituents are attached to these rings through any available carbon or nitrogen by replacement of a hydrogen on said carbon or nitrogen.

When a compound is substituted with a substituent bearing a subscript that indicates the number of said substituents can exceed 1, said substituents (when they exceed 1) are independently selected from the group of defined substituents. Further, when the subscript indicates a range, e.g. $(R)_{i-j}$, then the number of substituents may be selected from the integers between i and j inclusive.

When a group contains a substituent which can be hydrogen, for example R^{10}, then, when this substituent is taken as hydrogen, it is recognized that this is equivalent to said group being unsubstituted.

The compounds of this invention thus include compounds of Formula I, geometric and stereoisomers thereof, *N*-oxides thereof, and agriculturally suitable salts thereof. The compound of the invention can exist as one or more stereoisomers. The various stereoisomers include enantiomers, diastereomers, atropisomers and geometric isomers. One skilled in the art will appreciate that one stereoisomer may be more active and/or may exhibit beneficial effects when enriched relative to the other stereoisomer(s) or when separated from the other stereoisomer(s). Additionally, the skilled artisan knows how to separate, enrich, and/or to selectively prepare said stereoisomers. The compounds of the invention may be present as a mixture of stereoisomers, individual stereoisomers, or as an optically active form.

The salts of the compounds of the invention include acid-addition salts with inorganic or organic acids such as hydrobromic, hydrochloric, nitric, phosphoric, sulfuric, acetic, butyric, fumaric, lactic, maleic, malonic, oxalic, propionic, salicylic, tartaric, 4-toluenesulfonic or valeric acids. The salts of the compounds of the invention also include those formed with organic bases (e.g., pyridine, ammonia, or triethylamine) or inorganic

bases (e.g., hydrides, hydroxides, or carbonates of sodium, potassium, lithium, calcium, magnesium or barium) when the compound contains an acidic group such as a carboxylic acid or phenol.

Preferred compounds of the invention for reasons of better activity and/or ease of synthesis are:

Preferred 1. Compounds of Formula I above, geometric and stereoisomers thereof, *N*-oxides thereof, and agriculturally-suitable salts thereof, wherein:

Q is O;

R^1 and R^2 are independently H, C_1-C_4 alkyl or C_1-C_4 alkoxy; and

R^3 is halogen, C_1-C_4 haloalkyl, C_1-C_4 haloalkoxy or C_1-C_4 haloalkylthio.

Preferred 2. Compounds of Preferred 1 wherein:

W is N;

Y is CR^9; and

R^5 is H.

Preferred 3. Compounds of Preferred 2 wherein:

R^2 is H; and

each R^4 is independently halogen, C_1-C_4 haloalkyl, C_1-C_4 haloalkoxy or C_1-C_4 haloalkylthio.

Most preferred are compounds of Formula I above selected from the group:

(a) 5-methyl-4-[3-(trifluoromethyl)phenoxy]-2-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]pyrimidine;

(b) 4-[3-(trifluoromethyl)phenoxy]-2-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]pyrimidine;

(c) 5-methyl-4-[3-(trifluoromethoxy)phenoxy]-2-[4-(trifluoromethyl)-1*H*-imidazol-1-yl]pyrimidine;

(d) 5-methyl-2-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]-4-[[6-(trifluoromethyl)-2-pyridinyl]oxy]pyrimidine;

(e) 5-methyl-4-[3-(trifluoromethyl)phenoxy]-2-[3-(trifluoromethyl)-1*H*-1,2,4-triazol-1-yl]pyrimidine;

(f) 5-methyl-2-[4-(trifluoromethyl)-1*H*-imidazol-1-yl]-4-[3-(trifluoromethyl)phenoxy]pyrimidine;

(g) 5-ethyl-4-[3-(trifluoromethyl)phenoxy]-2-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]pyrimidine;

(h) 5-ethyl-4-[3-(trifluoromethoxy)phenoxy]-2-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]pyrimidine;

(i) 5-ethyl-2-[4-(trifluoromethyl)-1*H*-imidazol-1-yl]-4-[3-(trifluoromethyl)phenoxy]pyrimidine; and

(j) 5-ethyl-4-[3-(trifluoromethoxy)phenoxy]-2-[4-(trifluoromethyl)-1*H*-imidazol-1-yl]pyrimidine.

This invention also relates to herbicidal compositions comprising herbicidally effective amounts of the compounds of the invention and at least one of a surfactant, a solid diluent or a liquid diluent. The preferred compositions of the present invention are those which comprise the above preferred compounds.

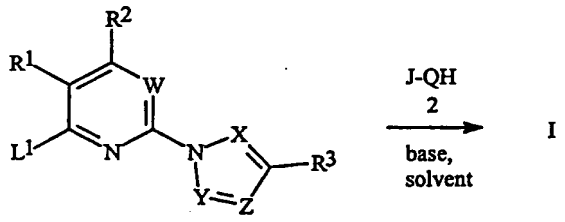
This invention also relates to a method for controlling undesired vegetation comprising applying to the locus of the vegetation herbicidally effective amounts of the compounds of the invention (e.g., as a composition described herein). The preferred methods of use are those involving the above preferred compounds.

DETAILS OF THE INVENTION

The compounds of Formula I can be prepared by one or more of the following methods and variations as described in Schemes 1-5. The definitions of J, Q, W, X, Y, Z, R^1, R^2 and R^3 in the compounds of Formulae 1-4 below are as defined above in the Summary of the Invention.

Scheme 1 illustrates the preparation of compounds of Formula I wherein compounds of Formula 1 are allowed to react with compounds of Formula 2 and a suitable base such as potassium carbonate, potassium hydroxide or sodium hydride in a solvent such as *N,N*-dimethylformamide, acetonitrile, or tetrahydrofuran at temperatures ranging from 0 °C to 130 °C.

Scheme 1

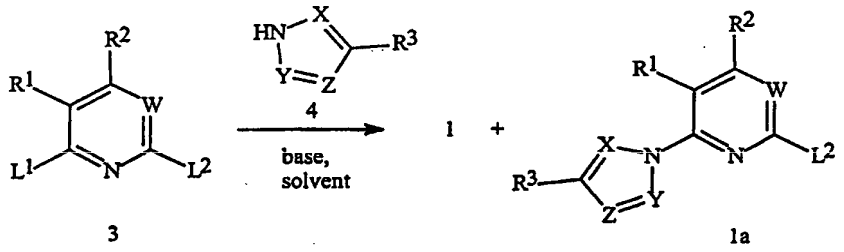


1

L^1 is a leaving group such as halogen or methylsulfonyl

Heterocycles of Formula 1 where L^1 is halogen can be prepared by reacting pyridines or pyrimidines of Formula 3 with azoles of Formula 4 in the presence of a base such as potassium carbonate, potassium hydroxide or sodium hydride in a solvent such as *N,N*-dimethylformamide, acetonitrile, or tetrahydrofuran at temperatures ranging from 0 °C to 130 °C (Scheme 2). This condensation generally gives rise to mixtures of products of Formula 1 and 1a which can be separated by silica gel chromatography.

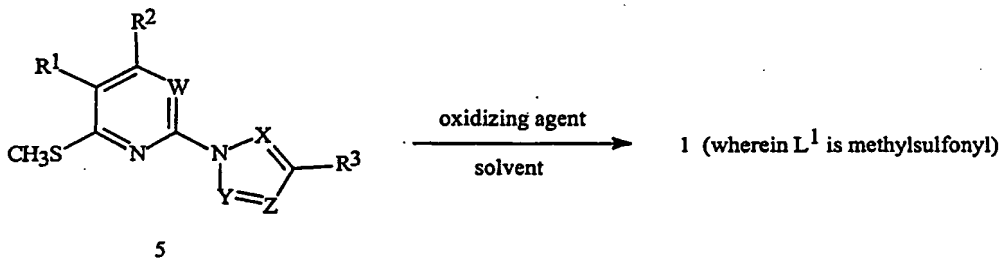
Scheme 2



L^1 and L^2 are halogen

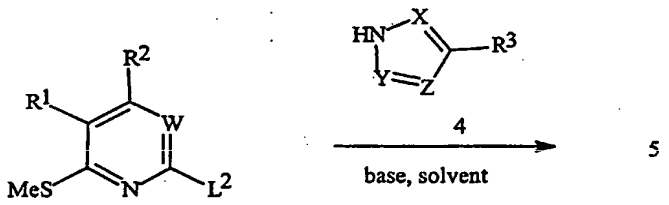
As shown in Scheme 3, heterocycles of Formula 1 where L^1 is methylsulfonyl can be prepared from compounds of Formula 5 by oxidation with *m*-chloroperoxybenzoic acid in a halogenated solvent such as dichloromethane or with Oxone® (potassium peroxymonosulfate) in an alcohol solvent such as methanol at temperatures ranging from 0 °C to 60 °C. This type of oxidation reaction is well known in the art; for example, see March, J. *Advanced Organic Chemistry*; John Wiley: New York, 1992; 4th edition, pp 1201-1203.

Scheme 3



Scheme 4 illustrates the preparation of compounds of Formula 5 wherein compounds of Formula 6 (where L^2 is halogen) are allowed to react with compounds of Formula 4 and a suitable base such as potassium carbonate, potassium hydroxide or sodium hydride in a solvent such as *N*,*N*-dimethylformamide or acetonitrile at temperatures ranging from 0 °C to 130 °C.

Scheme 4

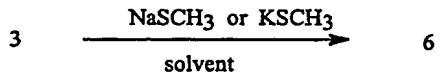


6

(wherein L^2 is halogen)

Compounds of Formula 6 can be readily prepared by reaction of compounds of Formula 3 with the sodium or potassium salt of methyl mercaptan in a solvent such as tetrahydrofuran or dioxane at temperatures ranging from 0 °C to 80 °C.

Scheme 5



Dihaloheterocycles of Formula 3 can be obtained commercially or are readily prepared by known methods in the art; for example, see *Advances in Heterocyclic Chemistry*; Katritzky, A.R., Ed.; Academic Press: New York, 1993, volume 58, pp 301-305; *Heterocyclic Compounds*; Elderfield, R.C., Ed.; John Wiley: New York, 1957; volume 6, chapter 7, pp 265-270.

Compounds of Formula 4 can be obtained commercially or can be prepared by methods that are known in the art; for examples, see Elguero, J. et al. *Organic Preparations and Procedures Int.* (1995), *27*, pp 33-74; *Comprehensive Heterocyclic Chemistry*; Potts, K., Ed.; Pergamon Press: New York, 1984; volume 5, chapters 4.04 - 4.13; *Heterocyclic Compounds*; Elderfield, R., Ed.; John Wiley: New York, 1957; volume 5, chapters 2 and 4; and Baldwin, J. et al. *J. Med. Chem.*(1975), *18*, pp 895-900; Evans, J.J. et al. U.S. Patent 4,038,405 (1977).

As described for the oxidation above, compounds of Formula I wherein Q is $S(O)_n$ and n is 1 or 2 can be prepared from compounds of Formula I wherein Q is $S(O)_n$ and n is 0 by treatment with an oxidizing reagent such as *m*-chloroperoxybenzoic acid or Oxone® (potassium peroxymonosulfate).

It is recognized that some reagents and reaction conditions described above for preparing compounds of Formula I may not be compatible with certain functionalities present in the intermediates. In these instances, the incorporation of protection/deprotection

sequences or functional group interconversions into the synthesis will aid in obtaining the desired products. The use and choice of the protecting groups will be apparent to one skilled in chemical synthesis (see, for example, Greene, T. W.; Wuts, P. G. M. *Protective Groups in Organic Synthesis*, 2nd ed.; Wiley: New York, 1991). One skilled in the art will recognize that, in some cases, after the introduction of a given reagent as it is depicted in any individual scheme, it may be necessary to perform additional routine synthetic steps not described in detail to complete the synthesis of compounds of Formula I. One skilled in the art will also recognize that it may be necessary to perform a combination of the steps illustrated in the above schemes in an order other than that implied by the particular sequence presented to prepare the compounds of Formula I.

One skilled in the art will also recognize that compounds of Formula I and the intermediates described herein can be subjected to various electrophilic, nucleophilic, radical, organometallic, oxidation, and reduction reactions to add substituents or modify existing substituents.

Without further elaboration, it is believed that one skilled in the art using the preceding description can utilize the present invention to its fullest extent. The following Examples are, therefore, to be construed as merely illustrative, and not limiting of the disclosure in any way whatsoever. Percentages are by weight except for chromatographic solvent mixtures or where otherwise indicated. Parts and percentages for chromatographic solvent mixtures are by volume unless otherwise indicated. ^{1}H NMR spectra are reported in ppm downfield from tetramethylsilane; s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet, dd = doublet of doublets, dt = doublet of triplets, br s = broad singlet.

EXAMPLE 1

Step A: Preparation of 2-bromo-6-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]pyridine

A mixture of 2,6-dibromopyridine (3.5 g, 22 mmol), 3-(trifluoromethyl)-1*H*-pyrazole 2.0 g, 15 mmol) and potassium carbonate (4.0 g, 29 mmol) was heated in 25 mL of *N,N*-dimethylformamide at 90 °C for 3 h. The reaction mixture was partitioned between ethyl acetate and water. The separated organic layer was washed twice with brine, dried over magnesium sulfate, and evaporated under reduced pressure to give an oily residue which was purified by flash chromatography on silica gel (50:1 to 20:1 hexane/ethyl acetate) to yield 1.2 g of the title compound of Step A as a white solid melting at 55-56 °C. ^{1}H NMR ($CDCl_3$): δ 6.73 (d, 1H), 7.45 (d, 1H), 7.71 (t, 1H), 7.97 (d, 1H), 8.60 (d, 1H).

Step B: Preparation of 2-[3-(trifluoromethyl)phenoxy]-6-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]pyridine

A mixture of the title compound of Step A (0.9 g, 3.1 mmol), 3-trifluoromethylphenol (0.7 g, 4.3 mmol) and potassium carbonate (0.9 g, 6.5 mmol) was heated in 15 mL of *N,N*-dimethylformamide at 110-120 °C for 7 h. The reaction mixture was then partitioned between ethyl acetate and water. The separated organic layer was washed

with water and brine, dried over magnesium sulfate, and evaporated under reduced pressure to give an oily residue. Purification by flash chromatography on silica gel (40:1 hexane/ethyl acetate) afforded 1.1 g of the title compound of Step B, a compound of this invention, as a white solid melting at 53-55 °C. ^{1}H NMR ($CDCl_3$): δ 6.60 (d, 1H), 6.92 (d, 1H), 7.36 (d, 1H), 7.43-7.60 (m, 3H), 7.73 (d, 1H), 7.88 (t, 1H), 8.12 (d, 1H).

EXAMPLE 2

Step A: Preparation of 4-chloro-2-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]pyrimidine

A mixture of 2,4-dichloropyrimidine (3.0 g, 20 mmol), 3-(trifluoromethyl)-1*H*-pyrazole (2.5 g, 18 mmol) and potassium carbonate (5.0 g, 36 mmol) was stirred in 25 mL of *N,N*-dimethylformamide at room temperature overnight. The reaction mixture was partitioned between ethyl acetate and water. The separated organic layer was washed twice with brine, dried over magnesium sulfate, and evaporated under reduced pressure to a crude solid. Flash chromatography on silica gel (50:1 to 25:1 to 10:1 to 3:1 hexane/ethyl acetate) afforded 0.5 g of the title compound of Step A as a solid melting at 123-125 °C and 2.3 g of the isomer 2-chloro-6-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]pyrimidine as a solid melting at 111-112 °C. ^{1}H NMR ($CDCl_3$): δ 6.77 (d, 1H), 7.35 (d, 1H), 8.65 (d, 1H), 8.70 (d, 1H).

Step B: Preparation of 4-[3-(trifluoromethyl)phenoxy]-2-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]pyrimidine

A mixture of the title compound of Step A (0.5 g, 2 mmol), 3-trifluoromethylphenol (0.4 g, 2.5 mmol) and potassium carbonate (0.5 g, 3.6 mmol) was stirred in 10 mL of *N,N*-dimethylformamide at room temperature overnight. The reaction mixture was partitioned between ethyl acetate and water. The separated organic layer was washed twice with brine, dried over magnesium sulfate, and evaporated under reduced pressure to give an oily residue. Flash chromatography on silica gel (5:1 to 3:1 hexane/ethyl acetate) afforded 0.3 g of the title compound of Step B, a compound of this invention, as a white solid, melting at 72-73 °C. ^{1}H NMR ($CDCl_3$): δ 6.65 (d, 1H), 6.91 (d, 1H), 7.40-7.65 (m, 4H), 8.22 (d, 1H), 8.71 (d, 1H).

EXAMPLE 3

Step A: Preparation of 2-chloro-5-methyl-4-methylthiopyrimidine

To a solution of 2,4-dichloro-5-methylpyrimidine (10.0 g, 61 mmol) stirring in 200 mL of tetrahydrofuran was added sodium thiomethoxide (5.0 g, 71 mmol) and the mixture stirred at room temperature overnight. The reaction mixture was partitioned between 200 mL of ethyl acetate and 200 mL of water. The separated organic layer was washed twice with water and brine, dried over magnesium sulfate, and evaporated under reduced pressure to give a white solid which was suspended in a minimal amount of hexanes and filtered. Additional solid was filtered from the filtrate several times and all of the crops were combined to give 9.3 g of the title compound of Step A as a solid melting at 75-77 °C. ^{1}H NMR ($CDCl_3$): δ 8.02 (s,1H), 2.60 (s, 3H) 2.17 (s, 3H).

Step B: Preparation of 5-methyl-4-methylthio-2-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]pyrimidine

A mixture of 2-chloro-5-methyl-4-methylthiopyrimidine (2.5 g, 14 mmol), 3-(trifluoromethyl)-1*H*-pyrazole (2.3 g, 2.5 mmol) and potassium carbonate (4.8 g, 35 mmol) in 25 mL of *N,N*-dimethylformamide was heated at 70 °C with stirring for 5 hours. The reaction mixture was then partitioned between ethyl acetate and water. The organic layer was separated, washed twice with water and brine and dried over magnesium sulfate. The solvent was removed under reduced pressure to provide a white solid which was suspended in hexane and filtered to provide 2.4 g of the title compound of Step B as a solid melting at 126-127 °C. ^{1}H NMR ($CDCl_3$): δ 8.63 (d,1H), 8.24 (s, 1H), 6.73 (d, 1H), 2.68 (s, 3H) 2.25 (s, 3H).

Step C: Preparation of 5-methyl-4-(methylsulfonyl)-2-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]pyrimidine

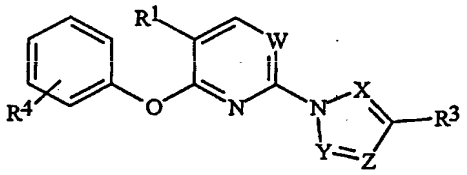
To a solution of 5-methyl-4-methylthio-2-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]pyrimidine (2.4 g, 9 mmol) stirred in 40 mL of dichloromethane was added *m*-chloroperoxybenzoic acid (5 g, 57-86%). A solid gradually precipitated and the white slurry stirred overnight at room temperature. The reaction mixture was filtered and the filtrate evaporated under reduced pressure to give a residue which was dissolved in 130 mL of diethyl ether. After washing twice with aqueous sodium bisulfite, three times with aqueous sodium bicarbonate and brine, the organic layer was dried over magnesium sulfate. The solvent was removed under reduced pressure to give a white solid which was suspended in hexane and filtered to give 2.4 g of the title compound of Step C as a solid melting at 129-131 °C. ^{1}H NMR ($CDCl_3$): δ 8.87 (s,1H), 8.57 (d, 1H), 6.79 (d, 1H), 3.49 (s, 3H) 2.73 (s, 3H).

Step D: Preparation of 5-methyl-4-[3-(trifluoromethyl)phenoxyl-2-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]pyrimidine

A mixture of 5-methyl-4-methylsulfonyl-2-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]pyrimidine (0.3 g, 1 mmol), 3-trifluoromethylphenol (0.2 mL, 1.3 mmol) and potassium carbonate (0.3 g, 2 mmol) in 10 mL of *N,N*-dimethylformamide was stirred at room temperature overnight. The reaction mixture was partitioned between ethyl acetate and water. The organic layer was separated and washed with water, saturated aqueous sodium bicarbonate and brine. After drying over magnesium sulfate, the solvent was removed under reduced pressure to give an oily residue. Purification by flash chromatography on silica gel (5:1 followed by 3:1 hexane/ethyl acetate) afforded 150 mg of the title compound of Step D, a compound of this invention, as a white solid melting at 113-115 °C. ^{1}H NMR ($CDCl_3$): δ 8.53 (s,1H), 8.07 (d, 1H), 7.65-7.58 (m, 2H), 7.57 (s, 1H), 7.47-7.40 (m, 1H), 6.61 (d, 1H), 2.48 (s, 3H).

By the procedures described herein together with methods known in the art, the following compounds of Tables 1 to 5 can be prepared.

TABLE 1



wherein X is N and Y and Z are CH

W	R^1	R^3	R^4	W	R^1	R^3	R^4
CH	H	CF_3	3-CF_3	N	CH_2CH_3	CF_3	3-CF_3
CH	H	CF_3	3-OCF_3	N	CH_2CH_3	CF_3	3-OCF_3
CH	H	CF_3	3-SCF_3	N	CH_2CH_3	CF_3	3-SCF_3
CH	H	CF_3	3-$OCHF_2$	N	CH_2CH_3	CF_3	3-$OCHF_2$
CH	H	CF_3	3-$SCHF_2$	N	CH_2CH_3	CF_3	3-$SCHF_2$
CH	H	CF_3	3-Cl	N	CH_2CH_3	CF_3	3-Cl
CH	H	$OCHF_2$	3-CF_3	N	CH_2CH_3	$OCHF_2$	3-CF_3
CH	H	$OCHF_2$	3-OCF_3	N	CH_2CH_3	$OCHF_2$	3-OCF_3
CH	H	$OCHF_2$	3-SCF_3	N	CH_2CH_3	$OCHF_2$	3-SCF_3
CH	H	$OCHF_2$	3-$OCHF_2$	N	CH_2CH_3	$OCHF_2$	3-$OCHF_2$
CH	H	$OCHF_2$	3-$SCHF_2$	N	CH_2CH_3	$OCHF_2$	3-$SCHF_2$
CH	H	$OCHF_2$	3-Cl	N	CH_2CH_3	$OCHF_2$	3-Cl
CH	H	$SCHF_2$	3-CF_3	N	CH_2CH_3	$SCHF_2$	3-CF_3
CH	H	$SCHF_2$	3-OCF_3	N	CH_2CH_3	$SCHF_2$	3-OCF_3
CH	H	$SCHF_2$	3-SCF_3	N	CH_2CH_3	$SCHF_2$	3-SCF_3
CH	H	$SCHF_2$	3-$OCHF_2$	N	CH_2CH_3	$SCHF_2$	3-$OCHF_2$
CH	H	$SCHF_2$	3-$SCHF_2$	N	CH_2CH_3	$SCHF_2$	3-$SCHF_2$
CH	H	$SCHF_2$	3-Cl	N	CH_2CH_3	$SCHF_2$	3-Cl
CH	H	OCF_3	3-CF_3	N	CH_2CH_3	OCF_3	3-CF_3
CH	H	OCF_3	3-OCF_3	N	CH_2CH_3	OCF_3	3-OCF_3
CH	H	OCF_3	3-SCF_3	N	CH_2CH_3	OCF_3	3-SCF_3
CH	H	OCF_3	3-$OCHF_2$	N	CH_2CH_3	OCF_3	3-$OCHF_2$
CH	H	OCF_3	3-$SCHF_2$	N	CH_2CH_3	OCF_3	3-$SCHF_2$
CH	H	OCF_3	3-Cl	N	CH_2CH_3	OCF_3	3-Cl
CH	H	SCF_3	3-CF_3	N	CH_2CH_3	SCF_3	3-CF_3
CH	H	SCF_3	3-OCF_3	N	CH_2CH_3	SCF_3	3-OCF_3

CH	H	SCF_3	3-SCF_3	N	CH_2CH_3	SCF_3	3-SCF_3
CH	H	SCF_3	3-$OCHF_2$	N	CH_2CH_3	SCF_3	3-$OCHF_2$
CH	H	SCF_3	3-$SCHF_2$	N	CH_2CH_3	SCF_3	3-$SCHF_2$
CH	H	SCF_3	3-Cl	N	CH_2CH_3	SCF_3	3-Cl
CH	H	Cl	3-CF_3	N	CH_2CH_3	Cl	3-CF_3
CH	H	Cl	3-OCF_3	N	CH_2CH_3	Cl	3-OCF_3
CH	H	Cl	3-SCF_3	N	CH_2CH_3	Cl	3-SCF_3
CH	H	Cl	3-$OCHF_2$	N	CH_2CH_3	Cl	3-$OCHF_2$
CH	H	Cl	3-$SCHF_2$	N	CH_2CH_3	Cl	3-$SCHF_2$
CH	H	Cl	3-Cl	N	CH_2CH_3	Cl	3-Cl
CH	CH_3	CF_3	3-CF_3	N	CH_3	CF_3	3-CF_3
CH	CH_3	CF_3	3-OCF_3	N	CH_3	CF_3	3-OCF_3
CH	CH_3	CF_3	3-SCF_3	N	CH_3	CF_3	3-SCF_3
CH	CH_3	CF_3	3-$OCHF_2$	N	CH_3	CF_3	3-$OCHF_2$
CH	CH_3	CF_3	3-$SCHF_2$	N	CH_3	CF_3	3-$SCHF_2$
CH	CH_3	CF_3	3-Cl	N	CH_3	CF_3	3-Cl
CH	CH_3	$OCHF_2$	3-CF_3	N	CH_3	$OCHF_2$	3-CF_3
CH	CH_3	$OCHF_2$	3-OCF_3	N	CH_3	$OCHF_2$	3-OCF_3
CH	CH_3	$OCHF_2$	3-SCF_3	N	CH_3	$OCHF_2$	3-SCF_3
CH	CH_3	$OCHF_2$	3-$OCHF_2$	N	CH_3	$OCHF_2$	3-$OCHF_2$
CH	CH_3	$OCHF_2$	3-$SCHF_2$	N	CH_3	$OCHF_2$	3-$SCHF_2$
CH	CH_3	$OCHF_2$	3-Cl	N	CH_3	$OCHF_2$	3-Cl
CH	CH_3	$SCHF_2$	3-CF_3	N	CH_3	$SCHF_2$	3-CF_3
CH	CH_3	$SCHF_2$	3-OCF_3	N	CH_3	$SCHF_2$	3-OCF_3
CH	CH_3	$SCHF_2$	3-SCF_3	N	CH_3	$SCHF_2$	3-SCF_3
CH	CH_3	$SCHF_2$	3-$OCHF_2$	N	CH_3	$SCHF_2$	3-$OCHF_2$
CH	CH_3	$SCHF_2$	3-$SCHF_2$	N	CH_3	$SCHF_2$	3-$SCHF_2$
CH	CH_3	$SCHF_2$	3-Cl	N	CH_3	$SCHF_2$	3-Cl
CH	CH_3	OCF_3	3-CF_3	N	CH_3	OCF_3	3-CF_3
CH	CH_3	OCF_3	3-OCF_3	N	CH_3	OCF_3	3-OCF_3
CH	CH_3	OCF_3	3-SCF_3	N	CH_3	OCF_3	3-SCF_3
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CH	CH_3	OCF_3	3-$SCHF_2$	N	CH_3	OCF_3	3-$SCHF_2$
CH	CH_3	OCF_3	3-Cl	N	CH_3	OCF_3	3-Cl
CH	CH_3	SCF_3	3-CF_3	N	CH_3	SCF_3	3-CF_3
CH	CH_3	SCF_3	3-OCF_3	N	CH_3	SCF_3	3-OCF_3
CH	CH_3	SCF_3	3-SCF_3	N	CH_3	SCF_3	3-SCF_3
CH	CH_3	SCF_3	3-$OCHF_2$	N	CH_3	SCF_3	3-$OCHF_2$

CH	CH_3	SCF_3	3-$SCHF_2$	N	CH_3	SCF_3	3-$SCHF_2$
CH	CH_3	SCF_3	3-Cl	N	CH_3	SCF_3	3-Cl
CH	CH_3	Cl	3-CF_3	N	CH_3	Cl	3-CF_3
CH	CH_3	Cl	3-OCF_3	N	CH_3	Cl	3-OCF_3
CH	CH_3	Cl	3-SCF_3	N	CH_3	Cl	3-SCF_3
CH	CH_3	Cl	3-$OCHF_2$	N	CH_3	Cl	3-$OCHF_2$
CH	CH_3	Cl	3-$SCHF_2$	N	CH_3	Cl	3-$SCHF_2$
CH	CH_3	Cl	3-Cl	N	CH_3	Cl	3-Cl
CH	OCH_3	CF_3	3-CF_3	N	OCH_3	CF_3	3-CF_3
CH	OCH_3	CF_3	3-OCF_3	N	OCH_3	CF_3	3-OCF_3
CH	OCH_3	CF_3	3-SCF_3	N	OCH_3	CF_3	3-SCF_3
CH	OCH_3	CF_3	3-$OCHF_2$	N	OCH_3	CF_3	3-$OCHF_2$
CH	OCH_3	CF_3	3-$SCHF_2$	N	OCH_3	CF_3	3-$SCHF_2$
CH	OCH_3	CF_3	3-Cl	N	OCH_3	CF_3	3-Cl
CH	OCH_3	$OCHF_2$	3-CF_3	N	OCH_3	$OCHF_2$	3-CF_3
CH	OCH_3	$OCHF_2$	3-OCF_3	N	OCH_3	$OCHF_2$	3-OCF_3
CH	OCH_3	$OCHF_2$	3-SCF_3	N	OCH_3	$OCHF_2$	3-SCF_3
CH	OCH_3	$OCHF_2$	3-$OCHF_2$	N	OCH_3	$OCHF_2$	3-$OCHF_2$
CH	OCH_3	$OCHF_2$	3-$SCHF_2$	N	OCH_3	$OCHF_2$	3-$SCHF_2$
CH	OCH_3	$OCHF_2$	3-Cl	N	OCH_3	$OCHF_2$	3-Cl
CH	OCH_3	$SCHF_2$	3-CF_3	N	OCH_3	$SCHF_2$	3-CF_3
CH	OCH_3	$SCHF_2$	3-OCF_3	N	OCH_3	$SCHF_2$	3-OCF_3
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CH	OCH_3	$SCHF_2$	3-$OCHF_2$	N	OCH_3	$SCHF_2$	3-$OCHF_2$
CH	OCH_3	$SCHF_2$	3-$SCHF_2$	N	OCH_3	$SCHF_2$	3-$SCHF_2$
CH	OCH_3	$SCHF_2$	3-Cl	N	OCH_3	$SCHF_2$	3-Cl
CH	OCH_3	OCF_3	3-CF_3	N	OCH_3	OCF_3	3-CF_3
CH	OCH_3	OCF_3	3-OCF_3	N	OCH_3	OCF_3	3-OCF_3
CH	OCH_3	OCF_3	3-SCF_3	N	OCH_3	OCF_3	3-SCF_3
CH	OCH_3	OCF_3	3-$OCHF_2$	N	OCH_3	OCF_3	3-$OCHF_2$
CH	OCH_3	OCF_3	3-$SCHF_2$	N	OCH_3	OCF_3	3-$SCHF_2$
CH	OCH_3	OCF_3	3-Cl	N	OCH_3	OCF_3	3-Cl
CH	OCH_3	SCF_3	3-CF_3	N	OCH_3	SCF_3	3-CF_3
CH	OCH_3	SCF_3	3-OCF_3	N	OCH_3	SCF_3	3-OCF_3
CH	OCH_3	SCF_3	3-SCF_3	N	OCH_3	SCF_3	3-SCF_3
CH	OCH_3	SCF_3	3-$OCHF_2$	N	OCH_3	SCF_3	3-$OCHF_2$
CH	OCH_3	SCF_3	3-$SCHF_2$	N	OCH_3	SCF_3	3-$SCHF_2$
CH	OCH_3	SCF_3	3-Cl	N	OCH_3	SCF_3	3-Cl

CH	OCH_3	Cl	3-CF_3	N	OCH_3	Cl	3-CF_3
CH	OCH_3	Cl	3-OCF_3	N	OCH_3	Cl	3-OCF_3
CH	OCH_3	Cl	3-SCF_3	N	OCH_3	Cl	3-SCF_3
CH	OCH_3	Cl	3-$OCHF_2$	N	OCH_3	Cl	3-$OCHF_2$
CH	OCH_3	Cl	3-$SCHF_2$	N	OCH_3	Cl	3-$SCHF_2$
CH	OCH_3	Cl	3-Cl	N	OCH_3	Cl	3-Cl

wherein Z is N and X and Y are CH

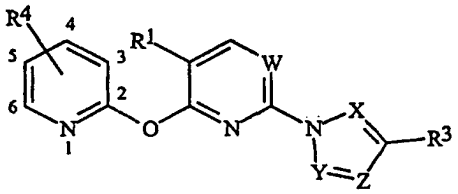
W	R^1	R^3	R^4	W	R^1	R^3	R^4
CH	H	CF_3	3-CF_3	N	CH_2CH_3	CF_3	3-CF_3
CH	H	CF_3	3-OCF_3	N	CH_2CH_3	CF_3	3-OCF_3
CH	H	CF_3	3-SCF_3	N	CH_2CH_3	CF_3	3-SCF_3
CH	H	CF_3	3-$OCHF_2$	N	CH_2CH_3	CF_3	3-$OCHF_2$
CH	H	CF_3	3-$SCHF_2$	N	CH_2CH_3	CF_3	3-$SCHF_2$
CH	H	CF_3	3-Cl	N	CH_2CH_3	CF_3	3-Cl
CH	H	$OCHF_2$	3-CF_3	N	CH_2CH_3	$OCHF_2$	3-CF_3
CH	H	$OCHF_2$	3-OCF_3	N	CH_2CH_3	$OCHF_2$	3-OCF_3
CH	H	$OCHF_2$	3-SCF_3	N	CH_2CH_3	$OCHF_2$	3-SCF_3
CH	H	$OCHF_2$	3-$OCHF_2$	N	CH_2CH_3	$OCHF_2$	3-$OCHF_2$
CH	H	$OCHF_2$	3-$SCHF_2$	N	CH_2CH_3	$OCHF_2$	3-$SCHF_2$
CH	H	$OCHF_2$	3-Cl	N	CH_2CH_3	$OCHF_2$	3-Cl
CH	H	$SCHF_2$	3-CF_3	N	CH_2CH_3	$SCHF_2$	3-CF_3
CH	H	$SCHF_2$	3-OCF_3	N	CH_2CH_3	$SCHF_2$	3-OCF_3
CH	H	$SCHF_2$	3-SCF_3	N	CH_2CH_3	$SCHF_2$	3-SCF_3
CH	H	$SCHF_2$	3-$OCHF_2$	N	CH_2CH_3	$SCHF_2$	3-$OCHF_2$
CH	H	$SCHF_2$	3-$SCHF_2$	N	CH_2CH_3	$SCHF_2$	3-$SCHF_2$
CH	H	$SCHF_2$	3-Cl	N	CH_2CH_3	$SCHF_2$	3-Cl
CH	H	OCF_3	3-CF_3	N	CH_2CH_3	OCF_3	3-CF_3
CH	H	OCF_3	3-OCF_3	N	CH_2CH_3	OCF_3	3-OCF_3
CH	H	OCF_3	3-SCF_3	N	CH_2CH_3	OCF_3	3-SCF_3
CH	H	OCF_3	3-$OCHF_2$	N	CH_2CH_3	OCF_3	3-$OCHF_2$
CH	H	OCF_3	3-$SCHF_2$	N	CH_2CH_3	OCF_3	3-$SCHF_2$
CH	H	OCF_3	3-Cl	N	CH_2CH_3	OCF_3	3-Cl
CH	H	SCF_3	3-CF_3	N	CH_2CH_3	SCF_3	3-CF_3
CH	H	SCF_3	3-OCF_3	N	CH_2CH_3	SCF_3	3-OCF_3
CH	H	SCF_3	3-SCF_3	N	CH_2CH_3	SCF_3	3-SCF_3
CH	H	SCF_3	3-$OCHF_2$	N	CH_2CH_3	SCF_3	3-$OCHF_2$
CH	H	SCF_3	3-$SCHF_2$	N	CH_2CH_3	SCF_3	3-$SCHF_2$

CH	H	SCF_3	3-Cl	N	CH_2CH_3	SCF_3	3-Cl
CH	H	Cl	3-CF_3	N	CH_2CH_3	Cl	3-CF_3
CH	H	Cl	3-OCF_3	N	CH_2CH_3	Cl	3-OCF_3
CH	H	Cl	3-SCF_3	N	CH_2CH_3	Cl	3-SCF_3
CH	H	Cl	3-$OCHF_2$	N	CH_2CH_3	Cl	3-$OCHF_2$
CH	H	Cl	3-$SCHF_2$	N	CH_2CH_3	Cl	3-$SCHF_2$
CH	H	Cl	3-Cl	N	CH_2CH_3	Cl	3-Cl
CH	CH_3	CF_3	3-CF_3	N	CH_3	CF_3	3-CF_3
CH	CH_3	CF_3	3-OCF_3	N	CH_3	CF_3	3-OCF_3
CH	CH_3	CF_3	3-SCF_3	N	CH_3	CF_3	3-SCF_3
CH	CH_3	CF_3	3-$OCHF_2$	N	CH_3	CF_3	3-$OCHF_2$
CH	CH_3	CF_3	3-$SCHF_2$	N	CH_3	CF_3	3-$SCHF_2$
CH	CH_3	CF_3	3-Cl	N	CH_3	CF_3	3-Cl
CH	CH_3	$OCHF_2$	3-CF_3	N	CH_3	$OCHF_2$	3-CF_3
CH	CH_3	$OCHF_2$	3-OCF_3	N	CH_3	$OCHF_2$	3-OCF_3
CH	CH_3	$OCHF_2$	3-SCF_3	N	CH_3	$OCHF_2$	3-SCF_3
CH	CH_3	$OCHF_2$	3-$OCHF_2$	N	CH_3	$OCHF_2$	3-$OCHF_2$
CH	CH_3	$OCHF_2$	3-$SCHF_2$	N	CH_3	$OCHF_2$	3-$SCHF_2$
CH	CH_3	$OCHF_2$	3-Cl	N	CH_3	$OCHF_2$	3-Cl
CH	CH_3	$SCHF_2$	3-CF_3	N	CH_3	$SCHF_2$	3-CF_3
CH	CH_3	$SCHF_2$	3-OCF_3	N	CH_3	$SCHF_2$	3-OCF_3
CH	CH_3	$SCHF_2$	3-SCF_3	N	CH_3	$SCHF_2$	3-SCF_3
CH	CH_3	$SCHF_2$	3-$OCHF_2$	N	CH_3	$SCHF_2$	3-$OCHF_2$
CH	CH_3	$SCHF_2$	3-$SCHF_2$	N	CH_3	$SCHF_2$	3-$SCHF_2$
CH	CH_3	$SCHF_2$	3-Cl	N	CH_3	$SCHF_2$	3-Cl
CH	CH_3	OCF_3	3-CF_3	N	CH_3	OCF_3	3-CF_3
CH	CH_3	OCF_3	3-OCF_3	N	CH_3	OCF_3	3-OCF_3
CH	CH_3	OCF_3	3-SCF_3	N	CH_3	OCF_3	3-SCF_3
CH	CH_3	OCF_3	3-$OCHF_2$	N	CH_3	OCF_3	3-$OCHF_2$
CH	CH_3	OCF_3	3-$SCHF_2$	N	CH_3	OCF_3	3-$SCHF_2$
CH	CH_3	OCF_3	3-Cl	N	CH_3	OCF_3	3-Cl
CH	CH_3	SCF_3	3-CF_3	N	CH_3	SCF_3	3-CF_3
CH	CH_3	SCF_3	3-OCF_3	N	CH_3	SCF_3	3-OCF_3
CH	CH_3	SCF_3	3-SCF_3	N	CH_3	SCF_3	3-SCF_3
CH	CH_3	SCF_3	3-$OCHF_2$	N	CH_3	SCF_3	3-$OCHF_2$
CH	CH_3	SCF_3	3-$SCHF_2$	N	CH_3	SCF_3	3-$SCHF_2$
CH	CH_3	SCF_3	3-Cl	N	CH_3	SCF_3	3-Cl
CH	CH_3	Cl	3-CF_3	N	CH_3	Cl	3-CF_3

CH	CH_3	Cl	3-OCF_3	N	CH_3	Cl	3-OCF_3
CH	CH_3	Cl	3-SCF_3	N	CH_3	Cl	3-SCF_3
CH	CH_3	Cl	3-$OCHF_2$	N	CH_3	Cl	3-$OCHF_2$
CH	CH_3	Cl	3-$SCHF_2$	N	CH_3	Cl	3-$SCHF_2$
CH	CH_3	Cl	3-Cl	N	CH_3	Cl	3-Cl
CH	OCH_3	CF_3	3-CF_3	N	OCH_3	CF_3	3-CF_3
CH	OCH_3	CF_3	3-OCF_3	N	OCH_3	CF_3	3-OCF_3
CH	OCH_3	CF_3	3-SCF_3	N	OCH_3	CF_3	3-SCF_3
CH	OCH_3	CF_3	3-$OCHF_2$	N	OCH_3	CF_3	3-$OCHF_2$
CH	OCH_3	CF_3	3-$SCHF_2$	N	OCH_3	CF_3	3-$SCHF_2$
CH	OCH_3	CF_3	3-Cl	N	OCH_3	CF_3	3-Cl
CH	OCH_3	$OCHF_2$	3-CF_3	N	OCH_3	$OCHF_2$	3-CF_3
CH	OCH_3	$OCHF_2$	3-OCF_3	N	OCH_3	$OCHF_2$	3-OCF_3
CH	OCH_3	$OCHF_2$	3-SCF_3	N	OCH_3	$OCHF_2$	3-SCF_3
CH	OCH_3	$OCHF_2$	3-$OCHF_2$	N	OCH_3	$OCHF_2$	3-$OCHF_2$
CH	OCH_3	$OCHF_2$	3-$SCHF_2$	N	OCH_3	$OCHF_2$	3-$SCHF_2$
CH	OCH_3	$OCHF_2$	3-Cl	N	OCH_3	$OCHF_2$	3-Cl
CH	OCH_3	$SCHF_2$	3-CF_3	N	OCH_3	$SCHF_2$	3-CF_3
CH	OCH_3	$SCHF_2$	3-OCF_3	N	OCH_3	$SCHF_2$	3-OCF_3
CH	OCH_3	$SCHF_2$	3-SCF_3	N	OCH_3	$SCHF_2$	3-SCF_3
CH	OCH_3	$SCHF_2$	3-$OCHF_2$	N	OCH_3	$SCHF_2$	3-$OCHF_2$
CH	OCH_3	$SCHF_2$	3-$SCHF_2$	N	OCH_3	$SCHF_2$	3-$SCHF_2$
CH	OCH_3	$SCHF_2$	3-Cl	N	OCH_3	$SCHF_2$	3-Cl
CH	OCH_3	OCF_3	3-CF_3	N	OCH_3	OCF_3	3-CF_3
CH	OCH_3	OCF_3	3-OCF_3	N	OCH_3	OCF_3	3-OCF_3
CH	OCH_3	OCF_3	3-SCF_3	N	OCH_3	OCF_3	3-SCF_3
CH	OCH_3	OCF_3	3-$OCHF_2$	N	OCH_3	OCF_3	3-$OCHF_2$
CH	OCH_3	OCF_3	3-$SCHF_2$	N	OCH_3	OCF_3	3-$SCHF_2$
CH	OCH_3	OCF_3	3-Cl	N	OCH_3	OCF_3	3-Cl
CH	OCH_3	SCF_3	3-CF_3	N	OCH_3	SCF_3	3-CF_3
CH	OCH_3	SCF_3	3-OCF_3	N	OCH_3	SCF_3	3-OCF_3
CH	OCH_3	SCF_3	3-SCF_3	N	OCH_3	SCF_3	3-SCF_3
CH	OCH_3	SCF_3	3-$OCHF_2$	N	OCH_3	SCF_3	3-$OCHF_2$
CH	OCH_3	SCF_3	3-$SCHF_2$	N	OCH_3	SCF_3	3-$SCHF_2$
CH	OCH_3	SCF_3	3-Cl	N	OCH_3	SCF_3	3-Cl
CH	OCH_3	Cl	3-CF_3	N	OCH_3	Cl	3-CF_3
CH	OCH_3	Cl	3-OCF_3	N	OCH_3	Cl	3-OCF_3

CH	OCH_3	Cl	3-SCF_3	N	OCH_3	Cl	3-SCF_3
CH	OCH_3	Cl	3-$OCHF_2$	N	OCH_3	Cl	3-$OCHF_2$
CH	OCH_3	Cl	3-$SCHF_2$	N	OCH_3	Cl	3-$SCHF_2$
CH	OCH_3	Cl	3-Cl	N	OCH_3	Cl	3-Cl

TABLE 2



wherein X is N and Y and Z are CH

W	R^1	R^3	R^4	W	R^1	R^3	R^4
CH	H	CF_3	6-CF_3	N	CH_2CH_3	CF_3	6-CF_3
CH	H	CF_3	6-OCF_3	N	CH_2CH_3	CF_3	6-OCF_3
CH	H	$OCHF_2$	6-CF_3	N	CH_2CH_3	$OCHF_2$	6-CF_3
CH	H	$OCHF_2$	6-OCF_3	N	CH_2CH_3	$OCHF_2$	6-OCF_3
CH	H	$SCHF_2$	6-CF_3	N	CH_2CH_3	$SCHF_2$	6-CF_3
CH	H	$SCHF_2$	6-OCF_3	N	CH_2CH_3	$SCHF_2$	6-OCF_3
CH	H	OCF_3	6-CF_3	N	CH_2CH_3	OCF_3	6-CF_3
CH	H	OCF_3	6-OCF_3	N	CH_2CH_3	OCF_3	6-OCF_3
CH	H	SCF_3	6-CF_3	N	CH_2CH_3	SCF_3	6-CF_3
CH	H	SCF_3	6-OCF_3	N	CH_2CH_3	SCF_3	6-OCF_3
CH	H	Cl	6-CF_3	N	CH_2CH_3	Cl	6-CF_3
CH	H	Cl	6-OCF_3	N	CH_2CH_3	Cl	6-OCF_3
CH	CH_3	CF_3	6-CF_3	N	CH_3	CF_3	6-CF_3
CH	CH_3	CF_3	6-OCF_3	N	CH_3	CF_3	6-OCF_3
CH	CH_3	$OCHF_2$	6-CF_3	N	CH_3	$OCHF_2$	6-CF_3
CH	CH_3	$OCHF_2$	6-OCF_3	N	CH_3	$OCHF_2$	6-OCF_3
CH	CH_3	$SCHF_2$	6-CF_3	N	CH_3	$SCHF_2$	6-CF_3
CH	CH_3	$SCHF_2$	6-OCF_3	N	CH_3	$SCHF_2$	6-OCF_3
CH	CH_3	OCF_3	6-CF_3	N	CH_3	OCF_3	6-CF_3
CH	CH_3	OCF_3	6-OCF_3	N	CH_3	OCF_3	6-OCF_3
CH	CH_3	SCF_3	6-CF_3	N	CH_3	SCF_3	6-CF_3
CH	CH_3	SCF_3	6-OCF_3	N	CH_3	SCF_3	6-OCF_3

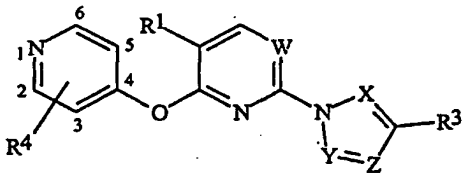
CH	CH_3	Cl	6-CF_3	N	CH_3	Cl	6-CF_3
CH	CH_3	Cl	6-OCF_3	N	CH_3	Cl	6-OCF_3
CH	OCH_3	CF_3	6-CF_3	N	OCH_3	CF_3	6-CF_3
CH	OCH_3	CF_3	6-OCF_3	N	OCH_3	CF_3	6-OCF_3
CH	OCH_3	$OCHF_2$	6-CF_3	N	OCH_3	$OCHF_2$	6-CF_3
CH	OCH_3	$OCHF_2$	6-OCF_3	N	OCH_3	$OCHF_2$	6-OCF_3
CH	OCH_3	$SCHF_2$	6-CF_3	N	OCH_3	$SCHF_2$	6-CF_3
CH	OCH_3	$SCHF_2$	6-OCF_3	N	OCH_3	$SCHF_2$	6-OCF_3
CH	OCH_3	OCF_3	6-CF_3	N	OCH_3	OCF_3	6-CF_3
CH	OCH_3	OCF_3	6-OCF_3	N	OCH_3	OCF_3	6-OCF_3
CH	OCH_3	SCF_3	6-CF_3	N	OCH_3	SCF_3	6-CF_3
CH	OCH_3	SCF_3	6-OCF_3	N	OCH_3	SCF_3	6-OCF_3
CH	OCH_3	Cl	6-CF_3	N	OCH_3	Cl	6-CF_3
CH	OCH_3	Cl	6-OCF_3	N	OCH_3	Cl	6-OCF_3

wherein Z is N and X and Y are CH

W	R^1	R^3	R^4	W	R^1	R^3	R^4
CH	H	CF_3	6-CF_3	N	CH_2CH_3	CF_3	6-CF_3
CH	H	CF_3	6-OCF_3	N	CH_2CH_3	CF_3	6-OCF_3
CH	H	$OCHF_2$	6-CF_3	N	CH_2CH_3	$OCHF_2$	6-CF_3
CH	H	$OCHF_2$	6-OCF_3	N	CH_2CH_3	$OCHF_2$	6-OCF_3
CH	H	$SCHF_2$	6-CF_3	N	CH_2CH_3	$SCHF_2$	6-CF_3
CH	H	$SCHF_2$	6-OCF_3	N	CH_2CH_3	$SCHF_2$	6-OCF_3
CH	H	OCF_3	6-CF_3	N	CH_2CH_3	OCF_3	6-CF_3
CH	H	OCF_3	6-OCF_3	N	CH_2CH_3	OCF_3	6-OCF_3
CH	H	SCF_3	6-CF_3	N	CH_2CH_3	SCF_3	6-CF_3
CH	H	SCF_3	6-OCF_3	N	CH_2CH_3	SCF_3	6-OCF_3
CH	H	Cl	6-CF_3	N	CH_2CH_3	Cl	6-CF_3
CH	H	Cl	6-OCF_3	N	CH_2CH_3	Cl	6-OCF_3
CH	CH_3	CF_3	6-CF_3	N	CH_3	CF_3	6-CF_3
CH	CH_3	CF_3	6-OCF_3	N	CH_3	CF_3	6-OCF_3
CH	CH_3	$OCHF_2$	6-CF_3	N	CH_3	$OCHF_2$	6-CF_3
CH	CH_3	$OCHF_2$	6-OCF_3	N	CH_3	$OCHF_2$	6-OCF_3
CH	CH_3	$SCHF_2$	6-CF_3	N	CH_3	$SCHF_2$	6-CF_3
CH	CH_3	$SCHF_2$	6-OCF_3	N	CH_3	$SCHF_2$	6-OCF_3
CH	CH_3	OCF_3	6-CF_3	N	CH_3	OCF_3	6-CF_3
CH	CH_3	OCF_3	6-OCF_3	N	CH_3	OCF_3	6-OCF_3
CH	CH_3	SCF_3	6-CF_3	N	CH_3	SCF_3	6-CF_3

CH	CH_3	SCF_3	6-OCF_3	N	CH_3	SCF_3	6-OCF_3
CH	CH_3	Cl	6-CF_3	N	CH_3	Cl	6-CF_3
CH	CH_3	Cl	6-OCF_3	N	CH_3	Cl	6-OCF_3
CH	OCH_3	CF_3	6-CF_3	N	OCH_3	CF_3	6-CF_3
CH	OCH_3	CF_3	6-OCF_3	N	OCH_3	CF_3	6-OCF_3
CH	OCH_3	$OCHF_2$	6-CF_3	N	OCH_3	$OCHF_2$	6-CF_3
CH	OCH_3	$OCHF_2$	6-OCF_3	N	OCH_3	$OCHF_2$	6-OCF_3
CH	OCH_3	$SCHF_2$	6-CF_3	N	OCH_3	$SCHF_2$	6-CF_3
CH	OCH_3	$SCHF_2$	6-OCF_3	N	OCH_3	$SCHF_2$	6-OCF_3
CH	OCH_3	OCF_3	6-CF_3	N	OCH_3	OCF_3	6-CF_3
CH	OCH_3	OCF_3	6-OCF_3	N	OCH_3	OCF_3	6-OCF_3
CH	OCH_3	SCF_3	6-CF_3	N	OCH_3	SCF_3	6-CF_3
CH	OCH_3	SCF_3	6-OCF_3	N	OCH_3	SCF_3	6-OCF_3
CH	OCH_3	Cl	6-CF_3	N	OCH_3	Cl	6-CF_3
CH	OCH_3	Cl	6-OCF_3	N	OCH_3	Cl	6-OCF_3

TABLE 3



wherein X is N and Y and Z are CH

W	R^1	R^3	R^4	W	R^1	R^3	R^4
CH	H	CF_3	2-CF_3	N	CH_2CH_3	CF_3	2-CF_3
CH	H	CF_3	2-OCF_3	N	CH_2CH_3	CF_3	2-OCF_3
CH	H	$OCHF_2$	2-CF_3	N	CH_2CH_3	$OCHF_2$	2-CF_3
CH	H	$OCHF_2$	2-OCF_3	N	CH_2CH_3	$OCHF_2$	2-OCF_3
CH	H	$SCHF_2$	2-CF_3	N	CH_2CH_3	$SCHF_2$	2-CF_3
CH	H	$SCHF_2$	2-OCF_3	N	CH_2CH_3	$SCHF_2$	2-OCF_3
CH	H	OCF_3	2-CF_3	N	CH_2CH_3	OCF_3	2-CF_3
CH	H	OCF_3	2-OCF_3	N	CH_2CH_3	OCF_3	2-OCF_3
CH	H	SCF_3	2-CF_3	N	CH_2CH_3	SCF_3	2-CF_3
CH	H	SCF_3	2-OCF_3	N	CH_2CH_3	SCF_3	2-OCF_3
CH	H	Cl	2-CF_3	N	CH_2CH_3	Cl	2-CF_3
CH	H	Cl	2-OCF_3	N	CH_2CH_3	Cl	2-OCF_3

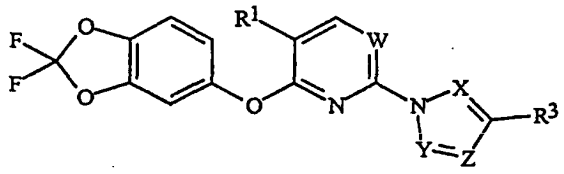
CH	CH_3	CF_3	2-CF_3	N	CH_3	CF_3	2-CF_3
CH	CH_3	CF_3	2-OCF_3	N	CH_3	CF_3	2-OCF_3
CH	CH_3	$OCHF_2$	2-CF_3	N	CH_3	$OCHF_2$	2-CF_3
CH	CH_3	$OCHF_2$	2-OCF_3	N	CH_3	$OCHF_2$	2-OCF_3
CH	CH_3	$SCHF_2$	2-CF_3	N	CH_3	$SCHF_2$	2-CF_3
CH	CH_3	$SCHF_2$	2-OCF_3	N	CH_3	$SCHF_2$	2-OCF_3
CH	CH_3	OCF_3	2-CF_3	N	CH_3	OCF_3	2-CF_3
CH	CH_3	OCF_3	2-OCF_3	N	CH_3	OCF_3	2-OCF_3
CH	CH_3	SCF_3	2-CF_3	N	CH_3	SCF_3	2-CF_3
CH	CH_3	SCF_3	2-OCF_3	N	CH_3	SCF_3	2-OCF_3
CH	CH_3	Cl	2-CF_3	N	CH_3	Cl	2-CF_3
CH	CH_3	Cl	2-OCF_3	N	CH_3	Cl	2-OCF_3
CH	OCH_3	CF_3	2-CF_3	N	OCH_3	CF_3	2-CF_3
CH	OCH_3	CF_3	2-OCF_3	N	OCH_3	CF_3	2-OCF_3
CH	OCH_3	$OCHF_2$	2-CF_3	N	OCH_3	$OCHF_2$	2-CF_3
CH	OCH_3	$OCHF_2$	2-OCF_3	N	OCH_3	$OCHF_2$	2-OCF_3
CH	OCH_3	$SCHF_2$	2-CF_3	N	OCH_3	$SCHF_2$	2-CF_3
CH	OCH_3	$SCHF_2$	2-OCF_3	N	OCH_3	$SCHF_2$	2-OCF_3
CH	OCH_3	OCF_3	2-CF_3	N	OCH_3	OCF_3	2-CF_3
CH	OCH_3	OCF_3	2-OCF_3	N	OCH_3	OCF_3	2-OCF_3
CH	OCH_3	SCF_3	2-CF_3	N	OCH_3	SCF_3	2-CF_3
CH	OCH_3	SCF_3	2-OCF_3	N	OCH_3	SCF_3	2-OCF_3
CH	OCH_3	Cl	2-CF_3	N	OCH_3	Cl	2-CF_3
CH	OCH_3	Cl	2-OCF_3	N	OCH_3	Cl	2-OCF_3

wherein Z is N and X and Y are CH

W	R^1	R^3	R^4	W	R^1	R^3	R^4
CH	H	CF_3	2-CF_3	N	CH_2CH_3	CF_3	2-CF_3
CH	H	CF_3	2-OCF_3	N	CH_2CH_3	CF_3	2-OCF_3
CH	H	$OCHF_2$	2-CF_3	N	CH_2CH_3	$OCHF_2$	2-CF_3
CH	H	$OCHF_2$	2-OCF_3	N	CH_2CH_3	$OCHF_2$	2-OCF_3
CH	H	$SCHF_2$	2-CF_3	N	CH_2CH_3	$SCHF_2$	2-CF_3
CH	H	$SCHF_2$	2-OCF_3	N	CH_2CH_3	$SCHF_2$	2-OCF_3
CH	H	OCF_3	2-CF_3	N	CH_2CH_3	OCF_3	2-CF_3
CH	H	OCF_3	2-OCF_3	N	CH_2CH_3	OCF_3	2-OCF_3
CH	H	SCF_3	2-CF_3	N	CH_2CH_3	SCF_3	2-CF_3
CH	H	SCF_3	2-OCF_3	N	CH_2CH_3	SCF_3	2-OCF_3
CH	H	Cl	2-CF_3	N	CH_2CH_3	Cl	2-CF_3

CH	H	Cl	2-OCF_3	N	CH_2CH_3	Cl	2-OCF_3
CH	CH_3	CF_3	2-CF_3	N	CH_3	CF_3	2-CF_3
CH	CH_3	CF_3	2-OCF_3	N	CH_3	CF_3	2-OCF_3
CH	CH_3	$OCHF_2$	2-CF_3	N	CH_3	$OCHF_2$	2-CF_3
CH	CH_3	$OCHF_2$	2-OCF_3	N	CH_3	$OCHF_2$	2-OCF_3
CH	CH_3	$SCHF_2$	2-CF_3	N	CH_3	$SCHF_2$	2-CF_3
CH	CH_3	$SCHF_2$	2-OCF_3	N	CH_3	$SCHF_2$	2-OCF_3
CH	CH_3	OCF_3	2-CF_3	N	CH_3	OCF_3	2-CF_3
CH	CH_3	OCF_3	2-OCF_3	N	CH_3	OCF_3	2-OCF_3
CH	CH_3	SCF_3	2-CF_3	N	CH_3	SCF_3	2-CF_3
CH	CH_3	SCF_3	2-OCF_3	N	CH_3	SCF_3	2-OCF_3
CH	CH_3	Cl	2-CF_3	N	CH_3	Cl	2-CF_3
CH	CH_3	Cl	2-OCF_3	N	CH_3	Cl	2-OCF_3
CH	OCH_3	CF_3	2-CF_3	N	OCH_3	CF_3	2-CF_3
CH	OCH_3	CF_3	2-OCF_3	N	OCH_3	CF_3	2-OCF_3
CH	OCH_3	$OCHF_2$	2-CF_3	N	OCH_3	$OCHF_2$	2-CF_3
CH	OCH_3	$OCHF_2$	2-OCF_3	N	OCH_3	$OCHF_2$	2-OCF_3
CH	OCH_3	$SCHF_2$	2-CF_3	N	OCH_3	$SCHF_2$	2-CF_3
CH	OCH_3	$SCHF_2$	2-OCF_3	N	OCH_3	$SCHF_2$	2-OCF_3
CH	OCH_3	OCF_3	2-CF_3	N	OCH_3	OCF_3	2-CF_3
CH	OCH_3	OCF_3	2-OCF_3	N	OCH_3	OCF_3	2-OCF_3
CH	OCH_3	SCF_3	2-CF_3	N	OCH_3	SCF_3	2-CF_3
CH	OCH_3	SCF_3	2-OCF_3	N	OCH_3	SCF_3	2-OCF_3
CH	OCH_3	Cl	2-CF_3	N	OCH_3	Cl	2-CF_3
CH	OCH_3	Cl	2-OCF_3	N	OCH_3	Cl	2-OCF_3

TABLE 4



wherein X is N and Y and Z are CH

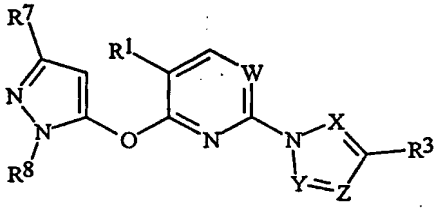
W	R^1	R^3	W	R^1	R^3
CH	H	CF_3	N	CH_2CH_3	CF_3
CH	H	$OCHF_2$	N	CH_2CH_3	$OCHF_2$
CH	H	$SCHF_2$	N	CH_2CH_3	$SCHF_2$
CH	H	OCF_3	N	CH_2CH_3	OCF_3
CH	H	SCF_3	N	CH_2CH_3	SCF_3
CH	H	Cl	N	CH_2CH_3	Cl
CH	CH_3	CF_3	N	CH_3	CF_3
CH	CH_3	$OCHF_2$	N	CH_3	$OCHF_2$
CH	CH_3	$SCHF_2$	N	CH_3	$SCHF_2$
CH	CH_3	OCF_3	N	CH_3	OCF_3
CH	CH_3	SCF_3	N	CH_3	SCF_3
CH	CH_3	Cl	N	CH_3	Cl
CH	OCH_3	CF_3	N	OCH_3	CF_3
CH	OCH_3	$OCHF_2$	N	OCH_3	$OCHF_2$
CH	OCH_3	$SCHF_2$	N	OCH_3	$SCHF_2$
CH	OCH_3	OCF_3	N	OCH_3	OCF_3
CH	OCH_3	SCF_3	N	OCH_3	SCF_3
CH	OCH_3	Cl	N	OCH_3	Cl

wherein Z is N and X and Y are CH

W	R^1	R^3	W	R^1	R^3
CH	H	CF_3	N	CH_2CH_3	CF_3
CH	H	$OCHF_2$	N	CH_2CH_3	$OCHF_2$
CH	H	$SCHF_2$	N	CH_2CH_3	$SCHF_2$
CH	H	OCF_3	N	CH_2CH_3	OCF_3
CH	H	SCF_3	N	CH_2CH_3	SCF_3
CH	H	Cl	N	CH_2CH_3	Cl
CH	CH_3	CF_3	N	CH_3	CF_3

CH	CH_3	$OCHF_2$	N	CH_3	$OCHF_2$
CH	CH_3	$SCHF_2$	N	CH_3	$SCHF_2$
CH	CH_3	OCF_3	N	CH_3	OCF_3
CH	CH_3	SCF_3	N	CH_3	SCF_3
CH	CH_3	Cl	N	CH_3	Cl
CH	OCH_3	CF_3	N	OCH_3	CF_3
CH	OCH_3	$OCHF_2$	N	OCH_3	$OCHF_2$
CH	OCH_3	$SCHF_2$	N	OCH_3	$SCHF_2$
CH	OCH_3	OCF_3	N	OCH_3	OCF_3
CH	OCH_3	SCF_3	N	OCH_3	SCF_3
CH	OCH_3	Cl	N	OCH_3	Cl

TABLE 5



wherein X is N and Y and Z are CH

W	R^1	R^3	R^7	R^8
CH	H	CF_3	CF_3	CH_3
CH	H	CF_3	CF_3	CH_2CF_3
CH	H	$OCHF_2$	CF_3	CH_3
CH	H	$OCHF_2$	CF_3	CH_2CF_3
CH	H	$SCHF_2$	CF_3	CH_3
CH	H	$SCHF_2$	CF_3	CH_2CF_3
CH	CH_3	CF_3	CF_3	CH_3
CH	CH_3	CF_3	CF_3	CH_2CF_3
CH	CH_3	$OCHF_2$	CF_3	CH_3
CH	CH_3	$OCHF_2$	CF_3	CH_2CF_3
CH	CH_3	$SCHF_2$	CF_3	CH_3
CH	CH_3	$SCHF_2$	CF_3	CH_2CF_3
CH	OCH_3	CF_3	CF_3	CH_3
CH	OCH_3	CF_3	CF_3	CH_2CF_3
CH	OCH_3	$OCHF_2$	CF_3	CH_3

CH	OCH_3	$OCHF_2$	CF_3	CH_2CF_3
CH	OCH_3	$SCHF_2$	CF_3	CH_3
CH	OCH_3	$SCHF_2$	CF_3	CH_2CF_3
N	CH_2CH_3	CF_3	CF_3	CH_3
N	CH_2CH_3	CF_3	CF_3	CH_2CF_3
N	CH_2CH_3	$OCHF_2$	CF_3	CH_3
N	CH_2CH_3	$OCHF_2$	CF_3	CH_2CF_3
N	CH_2CH_3	$SCHF_2$	CF_3	CH_3
N	CH_2CH_3	$SCHF_2$	CF_3	CH_2CF_3
N	CH_3	CF_3	CF_3	CH_3
N	CH_3	CF_3	CF_3	CH_2CF_3
N	CH_3	$OCHF_2$	CF_3	CH_3
N	CH_3	$OCHF_2$	CF_3	CH_2CF_3
N	CH_3	$SCHF_2$	CF_3	CH_3
N	CH_3	$SCHF_2$	CF_3	CH_2CF_3
N	OCH_3	CF_3	CF_3	CH_3
N	OCH_3	CF_3	CF_3	CH_2CF_3
N	OCH_3	$OCHF_2$	CF_3	CH_3
N	OCH_3	$OCHF_2$	CF_3	CH_2CF_3
N	OCH_3	$SCHF_2$	CF_3	CH_3
N	OCH_3	$SCHF_2$	CF_3	CH_2CF_3
CH	H	CF_3	$OCHF_2$	CH_3
CH	H	CF_3	$OCHF_2$	CH_2CF_3
CH	H	$OCHF_2$	$OCHF_2$	CH_3
CH	H	$OCHF_2$	$OCHF_2$	CH_2CF_3
CH	H	$SCHF_2$	$OCHF_2$	CH_3
CH	H	$SCHF_2$	$OCHF_2$	CH_2CF_3
CH	CH_3	CF_3	$OCHF_2$	CH_3
CH	CH_3	CF_3	$OCHF_2$	CH_2CF_3
CH	CH_3	$OCHF_2$	$OCHF_2$	CH_3
CH	CH_3	$OCHF_2$	$OCHF_2$	CH_2CF_3
CH	CH_3	$SCHF_2$	$OCHF_2$	CH_3
CH	CH_3	$SCHF_2$	$OCHF_2$	CH_2CF_3
CH	OCH_3	CF_3	$OCHF_2$	CH_3
CH	OCH_3	CF_3	$OCHF_2$	CH_2CF_3
CH	OCH_3	$OCHF_2$	$OCHF_2$	CH_3
CH	OCH_3	$OCHF_2$	$OCHF_2$	CH_2CF_3
CH	OCH_3	$SCHF_2$	$OCHF_2$	CH_3

CH	OCH_3	$SCHF_2$	$OCHF_2$	CH_2CF_3
N	CH_2CH_3	CF_3	$OCHF_2$	CH_3
N	CH_2CH_3	CF_3	$OCHF_2$	CH_2CF_3
N	CH_2CH_3	$OCHF_2$	$OCHF_2$	CH_3
N	CH_2CH_3	$OCHF_2$	$OCHF_2$	CH_2CF_3
N	CH_2CH_3	$SCHF_2$	$OCHF_2$	CH_3
N	CH_2CH_3	$SCHF_2$	$OCHF_2$	CH_2CF_3
N	CH_3	CF_3	$OCHF_2$	CH_3
N	CH_3	CF_3	$OCHF_2$	CH_2CF_3
N	CH_3	$OCHF_2$	$OCHF_2$	CH_3
N	CH_3	$OCHF_2$	$OCHF_2$	CH_2CF_3
N	CH_3	$SCHF_2$	$OCHF_2$	CH_3
N	CH_3	$SCHF_2$	$OCHF_2$	CH_2CF_3
N	OCH_3	CF_3	$OCHF_2$	CH_3
N	OCH_3	CF_3	$OCHF_2$	CH_2CF_3
N	OCH_3	$OCHF_2$	$OCHF_2$	CH_3
N	OCH_3	$OCHF_2$	$OCHF_2$	CH_2CF_3
N	OCH_3	$SCHF_2$	$OCHF_2$	CH_3
N	OCH_3	$SCHF_2$	$OCHF_2$	CH_2CF_3
CH	H	CF_3	$SCHF_2$	CH_3
CH	H	CF_3	$SCHF_2$	CH_2CF_3
CH	H	$OCHF_2$	$SCHF_2$	CH_3
CH	H	$OCHF_2$	$SCHF_2$	CH_2CF_3
CH	H	$SCHF_2$	$SCHF_2$	CH_3
CH	H	$SCHF_2$	$SCHF_2$	CH_2CF_3
CH	CH_3	CF_3	$SCHF_2$	CH_3
CH	CH_3	CF_3	$SCHF_2$	CH_2CF_3
CH	CH_3	$OCHF_2$	$SCHF_2$	CH_3
CH	CH_3	$OCHF_2$	$SCHF_2$	CH_2CF_3
CH	CH_3	$SCHF_2$	$SCHF_2$	CH_3
CH	CH_3	$SCHF_2$	$SCHF_2$	CH_2CF_3
CH	OCH_3	CF_3	$SCHF_2$	CH_3
CH	OCH_3	CF_3	$SCHF_2$	CH_2CF_3
CH	OCH_3	$OCHF_2$	$SCHF_2$	CH_3
CH	OCH_3	$OCHF_2$	$SCHF_2$	CH_2CF_3
CH	OCH_3	$SCHF_2$	$SCHF_2$	CH_3
CH	OCH_3	$SCHF_2$	$SCHF_2$	CH_2CF_3
N	CH_2CH_3	CF_3	$SCHF_2$	CH_3

N	CH_2CH_3	CF_3	$SCHF_2$	CH_2CF_3
N	CH_2CH_3	$OCHF_2$	$SCHF_2$	CH_3
N	CH_2CH_3	$OCHF_2$	$SCHF_2$	CH_2CF_3
N	CH_2CH_3	$SCHF_2$	$SCHF_2$	CH_3
N	CH_2CH_3	$SCHF_2$	$SCHF_2$	CH_2CF_3
N	CH_3	CF_3	$SCHF_2$	CH_3
N	CH_3	CF_3	$SCHF_2$	CH_2CF_3
N	CH_3	$OCHF_2$	$SCHF_2$	CH_3
N	CH_3	$OCHF_2$	$SCHF_2$	CH_2CF_3
N	CH_3	$SCHF_2$	$SCHF_2$	CH_3
N	CH_3	$SCHF_2$	$SCHF_2$	CH_2CF_3
N	OCH_3	CF_3	$SCHF_2$	CH_3
N	OCH_3	CF_3	$SCHF_2$	CH_2CF_3
N	OCH_3	$OCHF_2$	$SCHF_2$	CH_3
N	OCH_3	$OCHF_2$	$SCHF_2$	CH_2CF_3
N	OCH_3	$SCHF_2$	$SCHF_2$	CH_3
N	OCH_3	$SCHF_2$	$SCHF_2$	CH_2CF_3

wherein Z is N and X and Y are CH

W	R^1	R^3	R^7	R^8
CH	H	CF_3	CF_3	CH_3
CH	H	CF_3	CF_3	CH_2CF_3
CH	H	$OCHF_2$	CF_3	CH_3
CH	H	$OCHF_2$	CF_3	CH_2CF_3
CH	H	$SCHF_2$	CF_3	CH_3
CH	H	$SCHF_2$	CF_3	CH_2CF_3
CH	CH_3	CF_3	CF_3	CH_3
CH	CH_3	CF_3	CF_3	CH_2CF_3
CH	CH_3	$OCHF_2$	CF_3	CH_3
CH	CH_3	$OCHF_2$	CF_3	CH_2CF_3
CH	CH_3	$SCHF_2$	CF_3	CH_3
CH	CH_3	$SCHF_2$	CF_3	CH_2CF_3
CH	OCH_3	CF_3	CF_3	CH_3
CH	OCH_3	CF_3	CF_3	CH_2CF_3
CH	OCH_3	$OCHF_2$	CF_3	CH_3
CH	OCH_3	$OCHF_2$	CF_3	CH_2CF_3
CH	OCH_3	$SCHF_2$	CF_3	CH_3
CH	OCH_3	$SCHF_2$	CF_3	CH_2CF_3

N	CH_2CH_3	CF_3	CF_3	CH_3
N	CH_2CH_3	CF_3	CF_3	CH_2CF_3
N	CH_2CH_3	$OCHF_2$	CF_3	CH_3
N	CH_2CH_3	$OCHF_2$	CF_3	CH_2CF_3
N	CH_2CH_3	$SCHF_2$	CF_3	CH_3
N	CH_2CH_3	$SCHF_2$	CF_3	CH_2CF_3
N	CH_3	CF_3	CF_3	CH_3
N	CH_3	CF_3	CF_3	CH_2CF_3
N	CH_3	$OCHF_2$	CF_3	CH_3
N	CH_3	$OCHF_2$	CF_3	CH_2CF_3
N	CH_3	$SCHF_2$	CF_3	CH_3
N	CH_3	$SCHF_2$	CF_3	CH_2CF_3
N	OCH_3	CF_3	CF_3	CH_3
N	OCH_3	CF_3	CF_3	CH_2CF_3
N	OCH_3	$OCHF_2$	CF_3	CH_3
N	OCH_3	$OCHF_2$	CF_3	CH_2CF_3
N	OCH_3	$SCHF_2$	CF_3	CH_3
N	OCH_3	$SCHF_2$	CF_3	CH_2CF_3
CH	H	CF_3	$OCHF_2$	CH_3
CH	H	CF_3	$OCHF_2$	CH_2CF_3
CH	H	$OCHF_2$	$OCHF_2$	CH_3
CH	H	$OCHF_2$	$OCHF_2$	CH_2CF_3
CH	H	$SCHF_2$	$OCHF_2$	CH_3
CH	H	$SCHF_2$	$OCHF_2$	CH_2CF_3
CH	CH_3	CF_3	$OCHF_2$	CH_3
CH	CH_3	CF_3	$OCHF_2$	CH_2CF_3
CH	CH_3	$OCHF_2$	$OCHF_2$	CH_3
CH	CH_3	$OCHF_2$	$OCHF_2$	CH_2CF_3
CH	CH_3	$SCHF_2$	$OCHF_2$	CH_3
CH	CH_3	$SCHF_2$	$OCHF_2$	CH_2CF_3
CH	OCH_3	CF_3	$OCHF_2$	CH_3
CH	OCH_3	CF_3	$OCHF_2$	CH_2CF_3
CH	OCH_3	$OCHF_2$	$OCHF_2$	CH_3
CH	OCH_3	$OCHF_2$	$OCHF_2$	CH_2CF_3
CH	OCH_3	$SCHF_2$	$OCHF_2$	CH_3
CH	OCH_3	$SCHF_2$	$OCHF_2$	CH_2CF_3
N	CH_2CH_3	CF_3	$OCHF_2$	CH_3
N	CH_2CH_3	CF_3	$OCHF_2$	CH_2CF_3

N	CH_2CH_3	$OCHF_2$	$OCHF_2$	CH_3
N	CH_2CH_3	$OCHF_2$	$OCHF_2$	CH_2CF_3
N	CH_2CH_3	$SCHF_2$	$OCHF_2$	CH_3
N	CH_2CH_3	$SCHF_2$	$OCHF_2$	CH_2CF_3
N	CH_3	CF_3	$OCHF_2$	CH_3
N	CH_3	CF_3	$OCHF_2$	CH_2CF_3
N	CH_3	$OCHF_2$	$OCHF_2$	CH_3
N	CH_3	$OCHF_2$	$OCHF_2$	CH_2CF_3
N	CH_3	$SCHF_2$	$OCHF_2$	CH_3
N	CH_3	$SCHF_2$	$OCHF_2$	CH_2CF_3
N	OCH_3	CF_3	$OCHF_2$	CH_3
N	OCH_3	CF_3	$OCHF_2$	CH_2CF_3
N	OCH_3	$OCHF_2$	$OCHF_2$	CH_3
N	OCH_3	$OCHF_2$	$OCHF_2$	CH_2CF_3
N	OCH_3	$SCHF_2$	$OCHF_2$	CH_3
N	OCH_3	$SCHF_2$	$OCHF_2$	CH_2CF_3
CH	H	CF_3	$SCHF_2$	CH_3
CH	H	CF_3	$SCHF_2$	CH_2CF_3
CH	H	$OCHF_2$	$SCHF_2$	CH_3
CH	H	$OCHF_2$	$SCHF_2$	CH_2CF_3
CH	H	$SCHF_2$	$SCHF_2$	CH_3
CH	H	$SCHF_2$	$SCHF_2$	CH_2CF_3
CH	CH_3	CF_3	$SCHF_2$	CH_3
CH	CH_3	CF_3	$SCHF_2$	CH_2CF_3
CH	CH_3	$OCHF_2$	$SCHF_2$	CH_3
CH	CH_3	$OCHF_2$	$SCHF_2$	CH_2CF_3
CH	CH_3	$SCHF_2$	$SCHF_2$	CH_3
CH	CH_3	$SCHF_2$	$SCHF_2$	CH_2CF_3
CH	OCH_3	CF_3	$SCHF_2$	CH_3
CH	OCH_3	CF_3	$SCHF_2$	CH_2CF_3
CH	OCH_3	$OCHF_2$	$SCHF_2$	CH_3
CH	OCH_3	$OCHF_2$	$SCHF_2$	CH_2CF_3
CH	OCH_3	$SCHF_2$	$SCHF_2$	CH_3
CH	OCH_3	$SCHF_2$	$SCHF_2$	CH_2CF_3
N	CH_2CH_3	CF_3	$SCHF_2$	CH_3
N	CH_2CH_3	CF_3	$SCHF_2$	CH_2CF_3
N	CH_2CH_3	$OCHF_2$	$SCHF_2$	CH_3
N	CH_2CH_3	$OCHF_2$	$SCHF_2$	CH_2CF_3

N	CH_2CH_3	$SCHF_2$	$SCHF_2$	CH_3
N	CH_2CH_3	$SCHF_2$	$SCHF_2$	CH_2CF_3
N	CH_3	CF_3	$SCHF_2$	CH_3
N	CH_3	CF_3	$SCHF_2$	CH_2CF_3
N	CH_3	$OCHF_2$	$SCHF_2$	CH_3
N	CH_3	$OCHF_2$	$SCHF_2$	CH_2CF_3
N	CH_3	$SCHF_2$	$SCHF_2$	CH_3
N	CH_3	$SCHF_2$	$SCHF_2$	CH_2CF_3
N	OCH_3	CF_3	$SCHF_2$	CH_3
N	OCH_3	CF_3	$SCHF_2$	CH_2CF_3
N	OCH_3	$OCHF_2$	$SCHF_2$	CH_3
N	OCH_3	$OCHF_2$	$SCHF_2$	CH_2CF_3
N	OCH_3	$SCHF_2$	$SCHF_2$	CH_3
N	OCH_3	$SCHF_2$	$SCHF_2$	CH_2CF_3

Formulation/Utility

Compounds of this invention will generally be used as a formulation or composition with an agriculturally suitable carrier comprising at least one of a liquid diluent, a solid diluent or a surfactant. The formulation or composition ingredients are selected to be consistent with the physical properties of the active ingredient, mode of application and environmental factors such as soil type, moisture and temperature. Useful formulations include liquids such as solutions (including emulsifiable concentrates), suspensions, emulsions (including microemulsions and/or suspoemulsions) and the like which optionally can be thickened into gels. Useful formulations further include solids such as dusts, powders, granules, pellets, tablets, films, and the like which can be water-dispersible ("wettable") or water-soluble. Active ingredient can be (micro)encapsulated and further formed into a suspension or solid formulation; alternatively the entire formulation of active ingredient can be encapsulated (or "overcoated"). Encapsulation can control or delay release of the active ingredient. Sprayable formulations can be extended in suitable media and used at spray volumes from about one to several hundred liters per hectare. High-strength compositions are primarily used as intermediates for further formulation.

The formulations will typically contain effective amounts of active ingredient, diluent and surfactant within the following approximate ranges which add up to 100 percent by weight.

	Weight Percent		
	Active Ingredient	Diluent	Surfactant
Water-Dispersible and Water-soluble Granules, Tablets and Powders.	5–90	0–92	1–15
Suspensions, Emulsions, Solutions (including Emulsifiable Concentrates)	5–50	20–95	0–15
Dusts	1–25	70–99	0–5
Granules and Pellets	0.01–99	5–99.99	0–15
High Strength Compositions	90–99	0–10	0–2

Typical solid diluents are described in Watkins, et al., *Handbook of Insecticide Dust Diluents and Carriers*, 2nd Ed., Dorland Books, Caldwell, New Jersey. Typical liquid diluents are described in Marsden, *Solvents Guide*, 2nd Ed., Interscience, New York, 1950. *McCutcheon's Detergents and Emulsifiers Annual*, Allured Publ. Corp., Ridgewood, New Jersey, as well as Sisely and Wood, *Encyclopedia of Surface Active Agents*, Chemical Publ. Co., Inc., New York, 1962, list surfactants and recommended uses. All formulations can contain minor amounts of additives to reduce foam, caking, corrosion, microbiological growth and the like, or thickeners to increase viscosity.

Surfactants include, for example, polyethoxylated alcohols, polyethoxylated alkylphenols, polyethoxylated sorbitan fatty acid esters, dialkyl sulfosuccinates, alkyl sulfates, alkylbenzene sulfonates, organosilicones, *N,N*-dialkyltaurates, lignin sulfonates, naphthalene sulfonate formaldehyde condensates, polycarboxylates, and polyoxyethylene/polyoxypropylene block copolymers. Solid diluents include, for example, clays such as bentonite, montmorillonite, attapulgite and kaolin, starch, sugar, silica, talc, diatomaceous earth, urea, calcium carbonate, sodium carbonate and bicarbonate, and sodium sulfate. Liquid diluents include, for example, water, *N,N*-dimethylformamide, dimethyl sulfoxide, *N*-alkylpyrrolidone, ethylene glycol, polypropylene glycol, paraffins, alkylbenzenes, alkylnaphthalenes, oils of olive, castor, linseed, tung, sesame, corn, peanut, cotton-seed, soybean, rape-seed and coconut, fatty acid esters, ketones such as cyclohexanone, 2-heptanone, isophorone and 2-hydroxy-2-methyl-2-pentanone, and alcohols such as methanol, cyclohexanol, decanol and tetrahydrofurfuryl alcohol.

Solutions, including emulsifiable concentrates, can be prepared by simply mixing the ingredients. Dusts and powders can be prepared by blending and, usually, grinding as in a hammer mill or fluid-energy mill. Suspensions are usually prepared by wet-milling; see, for example, U.S. 3,060,082. Granules and pellets can be prepared by spraying the active material upon preformed granular carriers or by agglomeration techniques. See Browning, "Agglomeration", *Chemical Engineering*, December 2, 1967, pp 127-28, *Perry's Chemical Engineer's Handbook*, 2nd Ed., McGraw-Hill, New York, 1963, pages 8-57 and following,

and WO 91/13526. Pellets can be prepared as described in U.S. 2,172,712. Water-dispersible and water-soluble granules can be prepared as taught in U.S. 2,122,050, U.S. 3,920,222 and DE 3,226,293. Tablets can be prepared as taught in U.S. 5,180,587, U.S. 5,232,701 and U.S. 5,208,030. Films can be prepared as taught in GB 2,095,558 and U.S. 3,299,566.

For further information regarding the art of formulation, see U.S. 3,235,361, Col. 6, line 16 through Col. 7, line 19 and Examples 10-21; U.S. 3,309,192, Col. 5, line 23 through Col. 7, line 62 and Examples 8, 12, 15, 39, 21, 52, 53, 58, 132, 138-120, 162-162, 166, 167 and 169-182; U.S. 2,891,855, Col. 3, line 66 through Col. 5, line 17 and Examples 1-2; Klingman, *Weed Control as a Science*, John Wiley and Sons, Inc., New York, 1961, pp 81-96; and Hance et al., *Weed Control Handbook*, 8th Ed., Blackwell Scientific Publications, Oxford, 1989.

In the following Examples, all percentages are by weight and all formulations are prepared in conventional ways. Compound numbers refer to compounds in Index Tables A-D.

Example A

High Strength Concentrate	
Compound 20	98.5%
silica aerogel	0.5%
synthetic amorphous fine silica	1.0%.

Example B

Wettable Powder	
Compound 49	65.0%
dodecylphenol polyethylene glycol ether	2.0%
sodium ligninsulfonate	2.0%
sodium silicoaluminate	6.0%
montmorillonite (calcined)	23.0%.

Example C

Granule	
Compound 12	10.0%
attapulgite granules (low volatile matter, 0.71/0.30 mm; U.S.S. No. 25–50 sieves)	90.0%.

Example D

Extruded Pellet

Compound 56	25.0%
anhydrous sodium sulfate	10.0%
crude calcium ligninsulfonate	5.0%
sodium alkylnaphthalenesulfonate	1.0%
calcium/magnesium bentonite	59.0%.

Test results indicate that the compounds of the present invention are highly active preemergent and postemergent herbicides or plant growth regulants. Many of them have utility for broad-spectrum pre- and/or postemergence weed control in areas where complete control of all vegetation is desired such as around fuel storage tanks, industrial storage areas, parking lots, drive-in theaters, air fields, river banks, irrigation and other waterways, around billboards and highway and railroad structures. Some of the compounds are useful for the control of selected grass and broadleaf weeds with tolerance to important agronomic crops which include but are not limited to alfalfa, barley, cotton, wheat, rape, sugar beets, corn (maize), sorghum, soybeans, rice, oats, peanuts, vegetables, tomato, potato, perennial plantation crops including coffee, cocoa, oil palm, rubber, sugarcane, citrus, grapes, fruit trees, nut trees, banana, plantain, pineapple, hops, tea and forests such as eucalyptus and conifers (e.g., loblolly pine), and turf species (e.g., Kentucky bluegrass, St. Augustine grass, Kentucky fescue and Bermuda grass). Those skilled in the art will appreciate that not all compounds are equally effective against all weeds. Alternatively, the subject compounds are useful to modify plant growth.

A herbicidally effective amount of the compounds of this invention is determined by a number of factors. These factors include: formulation selected, method of application, amount and type of vegetation present, growing conditions, etc. In general, a herbicidally effective amount of compounds of this invention is 0.001 to 20 kg/ha with a preferred range of 0.002 to 1.0 kg/ha. One skilled in the art can easily determine the herbicidally effective amount necessary for the desired level of weed control.

Compounds of this invention can be used alone or in combination with other commercial herbicides, insecticides or fungicides. Compounds of this invention can also be used in combination with commercial herbicide safeners such as benoxacor, dichlormid and furilazole to increase safety to certain crops. A mixture of one or more of the following herbicides with a compound of this invention may be particularly useful for weed control: acetochlor, acifluorfen and its sodium salt, aclonifen, acrolein (2-propenal), alachlor, ametryn, amidosulfuron, amitrole, ammonium sulfamate, anilofos, asulam, atrazine, azafenidin, azimsulfuron, benazolin, benazolin-ethyl, benfluralin, benfuresate, bensulfuron-methyl, bensulide, bentazone, bifenox, bispyribac and its sodium salt, bromacil, bromoxynil, bromoxynil octanoate, butachlor, butralin, butroxydim (ICIA0500), butylate,

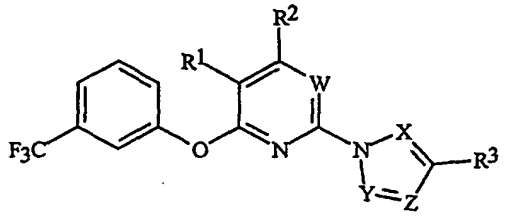
caloxydim (BAS 620H), carfentrazone-ethyl, chlomethoxyfen, chloramben, chlorbromuron, chloridazon, chlorimuron-ethyl, chlornitrofen, chlorotoluron, chlorpropham, chlorsulfuron, chlorthal-dimethyl, cinmethylin, cinosulfuron, clethodim, clomazone, clopyralid, clopyralid-olamine, cyanazine, cycloate, cyclosulfamuron, 2,2-D and its butotyl, butyl, isoctyl and isopropyl esters and its dimethylammonium, diolamine and trolamine salts, daimuron, dalapon, dalapon-sodium, dazomet, 2,2-DB and its dimethylammonium, potassium and sodium salts, desmedipham, desmetryn, dicamba and its diglycolammonium, dimethylammonium, potassium and sodium salts, dichlobenil, dichlorprop, diclofop-methyl, 2-[2,5-dihydro-2-methyl-2-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-5-methyl-3-pyridinecarboxylic acid (AC 263,222), difenzoquat metilsulfate, diflufenican, dimepiperate, dimethenamid, dimethylarsinic acid and its sodium salt, dinitramine, diphenamid, diquat dibromide, dithiopyr, diuron, DNOC, endothal, EPTC, esprocarb, ethalfluralin, ethametsulfuron-methyl, ethofumesate, ethoxysulfuron, fenoxaprop-ethyl, fenoxaprop-P-ethyl, fenuron, fenuron-TCA, flamprop-methyl, flamprop-M-isopropyl, flamprop-M-methyl, flazasulfuron, fluazifop-butyl, fluazifop-P-butyl, fluchloralin, flumetsulam, flumiclorac-pentyl, flumioxazin, fluometuron, fluoroglycofen-ethyl, flupoxam, flupyrsulfuron-methyl and its sodium salt, fluridone, flurochloridone, fluroxypyr, fluthiacet-methyl, fomesafen, fosamine-ammonium, glufosinate, glufosinate-ammonium, glyphosate, glyphosate-isopropylammonium, glyphosate-sesquisodium, glyphosate-trimesium, halosulfuron-methyl, haloxyfop-etotyl, haloxyfop-methyl, hexazinone, imazamethabenz-methyl, imazamox, imazapyr, imazaquin, imazaquin-ammonium, imazethapyr, imazethapyr-ammonium, imazosulfuron, ioxynil, ioxynil octanoate, ioxynil-sodium, isoproturon, isouron, isoxaben, isoxaflutole, lactofen, lenacil, linuron, maleic hydrazide, MCPA and its dimethylammonium, potassium and sodium salts, MCPA-isoctyl, mecoprop, mecoprop-P, mefenacet, mefluidide, metam-sodium, methabenzthiazuron, methylarsonic acid and its calcium, monoammonium, monosodium and disodium salts, methyl [[[1-[5-[2-chloro-2-(trifluoromethyl)phenoxy]-2-nitrophenyl]-2-methoxyethylidene]amino]oxy]acetate (AKH-7088), methyl 5-[[[[(2,6-dimethyl-2-pyrimidinyl)amino]carbonyl]amino]sulfonyl]-1-(2-pyridinyl)-1*H*-pyrazole-2-carboxylate (NC-330), metobenzuron, metolachlor, metosulam, metoxuron, metribuzin, metsulfuron-methyl, molinate, monolinuron, napropamide, naptalam, neburon, nicosulfuron, norflurazon, oryzalin, oxadiazon, oxasulfuron, oxyfluorfen, paraquat dichloride, pebulate, pendimethalin, pentoxazone (KPP-312), perfluidone, phenmedipham, picloram, picloram-potassium, pretilachlor, primisulfuron-methyl, prometon, prometryn, propachlor, propanil, propaquizafop, propazine, propham, propyzamide, prosulfuron, pyrazolynate, pyrazosulfuron-ethyl, pyridate, pyriminobac-methyl, pyrithiobac, pyrithiobac-sodium, quinclorac, quizalofop-ethyl, quizalofop-P-ethyl, quizalofop-P-tefuryl, rimsulfuron, sethoxydim, siduron, simazine, sulcotrione (ICIA0051), sulfentrazone, sulfometuron-methyl,

TCA, TCA-sodium, tebuthiuron, terbacil, terbuthylazine, terbutryn, thenylchlor, thiafluamide (BAY 11390), thifensulfuron-methyl, thiobencarb, tralkoxydim, tri-allate, triasulfuron, triaziflam, tribenuron-methyl, triclopyr, triclopyr-butotyl, triclopyr-triethylammonium, tridiphane, trifluralin, triflusulfuron-methyl, and vernolate.

In certain instances, combinations with other herbicides having a similar spectrum of control but a different mode of action will be particularly advantageous for preventing the development of resistant weeds.

The following Tests demonstrate the control efficacy of the compounds of this invention against specific weeds. The weed control afforded by the compounds is not limited, however, to these species. See Index Tables A-E for compound descriptions. The abbreviation "Ex." stands for "Example" and is followed by a number indicating in which example the compound is prepared.

INDEX TABLE A

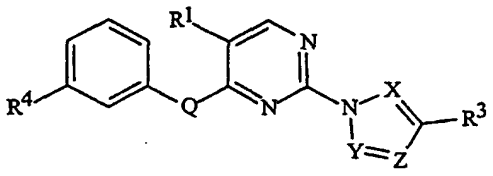


Cmpd	W	R^1	R^2	X	Y	Z	R^3	mp (°C)
1 (Ex. 1)	CH	H	H	N	CH	CH	CF_3	53-55
2	CH	H	H	CCl	CH	N	Cl	oil *
3	CH	H	H	N	CH	CBr	H	63-65
4	CH	H	H	N	CH	N	Cl	83-86
5	CH	H	H	CH	CH	N	CF_3	78-79
6 (Ex. 2)	N	H	H	N	CH	CH	CF_3	72-73
7	N	H	H	CCl	CH	N	Cl	80-89
8	N	H	H	N	CCH_3	CH	CF_3	110-112
9	N	H	H	N	CH	CBr	H	oil *
10	N	H	H	N	CH	N	Cl	83-86
11	N	H	CH_3	N	CH	CH	CF_3	93-95
12 (Ex. 3)	N	CH_3	H	N	CH	CH	CF_3	113-115
13	N	CH_3	H	CH	CH	N	CF_3	63-66
14	N	CH_3	H	N	CH	CCl	CF_3	108-109
15	N	CH_3	CH_3	N	CH	CH	CF_3	107-108
16	N	CH_3	H	N	CH	N	CF_3	114-115

17	N	CH_3	H	N	CH	CCN	CF_3	141-142
18	N	CH_2CH_3	H	N	CH	N	CF_3	97-98

*See Index Table E for ^1H NMR data.

INDEX TABLE B

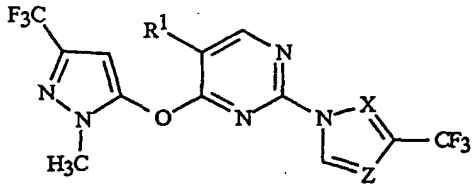


Cmpd	R^1	R^3	R^4	Q	X	Y	Z	mp (°C) or M+1
19	CH_3	CF_3	OCF_3	O	N	CH	CH	72-73
20	CH_3	CF_3	OCF_3	O	CH	CH	N	oil*
21	CH_3	CF_3	CF_3	S	N	CH	CH	101-102
22	CH_3	CF_3	OCF_3	O	N	CH	CCl	92-93
23	CH_3	CF_3	OCF_3	O	N	CH	CCN	139-141
24	CH_3	CF_3	OCF_3	O	N	CH	N	95-97
25	CH_3	CF_3	SCF_3	O	N	CH	CH	94-97
26	CH_3	CF_3	SCF_3	O	CH	CH	N	73-77
27	CH_3	CF_3	SCF_3	O	N	CH	CCl	98-101
28	CH_3	CF_3	Cl	O	N	CH	CH	69-70
29	CH_3	C_2F_5	CF_3	O	N	CH	CH	91-92
30	CH_3	CF_3	CF_3	O	CH	CCH_3	N	77-81
31	CH_3	$SO_2CH_2CH_3$	CF_3	O	N	CH	CH	117.5-119.5
32	CH_3	CF_3	CF_3	O	CH	CCH_2CH_3	N	113-115
33	CH_3	CHF_2	CF_3	O	N	CH	CH	67-72
34	CH_2CH_3	CF_3	CF_3	O	CH	CH	N	53-55
35	CH_2CH_3	CF_3	OCF_3	O	CH	CH	N	oil *
36	CH_2CH_3	CF_3	CF_3	O	N	CH	CH	108-109
37	CH_2CH_3	CF_3	OCF_3	O	N	CH	CH	64-66
38	CH_3	CF_3	$C(CH_3)_3$	O	N	CH	CH	83-85
39	OCH_3	CF_3	CF_3	O	N	CH	CH	109-111
40	OCH_3	CF_3	OCF_3	O	N	CH	CH	94-97
41	Br	CF_3	CF_3	O	N	CH	CH	139-142

42	CHF_2	CF_3	CF_3	O	N	CH	CH	114-118
43	$CHBr_2$	CF_3	CF_3	O	N	CH	CH	106-108
44	CH_3	CF_3	CN	O	N	CH	CH	*m/z* 346
45	CH_3	CF_3	F	O	N	CH	CH	*m/z* 339
46	CH_3	CF_3	I	O	N	CH	CH	*m/z* 447
47	CH_3	H	CF_3	O	N	CH	Cl	*m/z* 447
48	CH_3	H	CN	O	N	CH	Cl	*m/z* 404

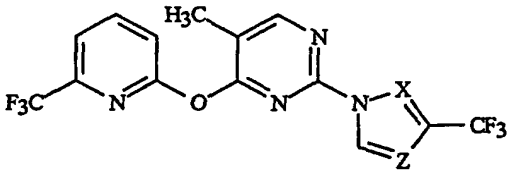
*See Index Table E for ^1H NMR data.

INDEX TABLE C



Cmpd	R^1	X	Z	mp (°C)
49	CH_3	N	CH	173-174
50	CH_3	CH	N	145-146
51	CH_3	N	CCl	178-179
52	CH_2CH_3	N	CH	146-147
53	OCH_3	N	CH	178-180
54	CH_2CH_3	N	CCN	103-108
55	CH_3	N	N	150-151

INDEX TABLE D



Cmpd	X	Z	mp (°C)
56	N	CH	170-172
57	N	CCl	150-153
58	N	N	149-150

INDEX TABLE E

Cmpd No.	^{1}H NMR Data ($CDCl_3$ solution unless indicated otherwise)[a]
2	δ 7.06 (d, 1H), 7.31 (d, 1H), 7.35-7.60 (m, 2H), 7.72 (s, 1H), 7.93 (dd, 1H).
9	δ 6.85 (d, 1H), 7.20-7.27 (m, 1H), 7.50 (s, 1H), 7.58-7.65 (m, 2H), 7.75 (s, 1H), 8.18 (s, 1H), 8.65 (d, 1H).
20	δ 8.38 (s, 1H), 8.28 (s, 1H), 7.89 (s, 1H), 7.49 (t, 1H), 7.25-7.10 (m, 3H), 2.37 (s, 3H).
35	δ 8.41 (s, 1H), 8.30 (s, 1H), 7.90 (s, 1H), 7.51 (t, 1H), 7.23 (d, 1H), 7.18-7.10 (m, 2H), 2.80 (q, 2H), 1.37 (t, 3H).

[a] ^{1}H NMR data are in ppm downfield from tetramethylsilane. Couplings are designated by (s)-singlet, (d)-doublet, (t)-triplet, (q)-quartet, (m)-multiplet, (dd)-doublet of doublets, (dt)-doublet of triplets, (br s)-broad singlet.

BIOLOGICAL EXAMPLES OF THE INVENTION

TEST A

Seeds of broadleaf signalgrass (*Brachiaria decumbens*), barley (*Hordeum vulgare*), barnyardgrass (*Echinochloa crus-galli*), bedstraw (*Galium aparine*), blackgrass (*Alopecurus myosuroides*), chickweed (*Stellaria media*), cocklebur (*Xanthium strumarium*), corn (*Zea mays*), cotton (*Gossypium hirsutum*), crabgrass (*Digitaria sanguinalis*), downy brome (*Bromus tectorum*), giant foxtail (*Setaria faberii*), lambsquarters (*Chenopodium album*), morningglory (*Ipomoea hederacea*), rape (*Brassica napus*), redroot pigweed (*Amaranthus retroflexus*), rice (*Oryza sativa*), sorghum (*Sorghum bicolor*), soybean (*Glycine max*), sugar beet (*Beta vulgaris*), velvetleaf (*Abutilon theophrasti*), wheat (*Triticum aestivum*), wild buckwheat (*Polygonum convolvulus*), wild oat (*Avena fatua*) and purple nutsedge (*Cyperus rotundus*) tubers were planted and treated preemergence with test chemicals formulated in a non-phytotoxic solvent mixture which included a surfactant. A sprayed paddy pot was treated with some designated compounds. This paddy contained rice, barnyardgrass, smallflowered flatsedge (*Cyperus difformis*) and duck salad (*Heteranthera limosa*) as the target species and was sprayed alongside the other crop and weed species.

At the same time, these crop and weed species were also treated with postemergence applications of test chemicals formulated in the same manner. Plants ranged in height from 2 to 18 cm (1- to 4-leaf stage) for postemergence treatments. Treated plants and controls were maintained in a greenhouse for twelve to sixteen days, after which all species were compared to controls and visually evaluated. Plant response ratings, summarized in Table A, are based on a scale of 0 to 10 where 0 is no effect and 10 is complete control. A dash (-) response means no test result.

Table A	COMPOUND							
Rate 2000 g/ha	1	2	3	4	5	6	7	11
POSTEMERGENCE								
B. signalgrass	-	-	-	-	-	-	-	-
Barley	6	3	2	5	5	5	4	2
Barnyardgrass	4	3	6	7	9	8	4	3
Bedstraw	9	9	10	10	9	9	9	3
Blackgrass	8	4	3	5	8	9	3	3
Chickweed	7	6	6	9	9	9	6	5
Cocklebur	7	6	4	7	8	8	8	6
Corn	3	2	2	3	3	3	2	3
Cotton	8	6	10	8	10	9	9	8
Crabgrass	8	4	8	9	9	9	6	8
Downy brome	3	3	2	3	6	5	3	2
Giant foxtail	4	3	4	9	9	9	4	6
Lambsquarters	9	8	9	9	9	9	7	9
Morningglory	9	4	9	7	9	9	9	8
Nutsedge	2	-	0	-	2	2	0	0
Rape	8	7	9	10	10	10	9	9
Redroot pigweed	-	-	-	-	-	-	-	-
Rice	3	2	3	3	4	3	1	3
Sorghum	4	2	3	3	4	4	2	2
Soybean	9	3	5	6	8	9	8	8
Sugar beet	9	8	10	10	10	10	9	9
Velvetleaf	7	7	7	7	9	9	7	1
Wheat	0	2	2	3	4	3	2	1
Wild buckwheat	7	8	5	9	8	9	10	6
Wild oat	4	3	4	4	5	5	4	3

Table A	COMPOUND			
Rate 1000 g/ha	13	14	19	49
POSTEMERGENCE				
B. signalgrass	10	8	7	8
Barley	-	-	-	-
Barnyardgrass	-	-	-	-
Bedstraw	9	10	9	9
Blackgrass	8	9	6	8
Chickweed	-	-	-	-
Cocklebur	9	10	8	9
Corn	6	4	7	8
Cotton	-	-	-	-
Crabgrass	9	10	9	9
Downy brome	-	-	-	-
Giant foxtail	9	10	9	9
Lambsquarters	-	-	-	-
Morningglory	10	10	8	9
Nutsedge	2	3	0	3
Rape	10	10	9	10
Redroot pigweed	9	10	9	9
Rice	-	-	-	-
Sorghum	-	-	-	-
Soybean	10	10	8	10
Sugar beet	9	10	9	9
Velvetleaf	9	9	7	9
Wheat	5	4	3	3
Wild buckwheat	-	-	-	-
Wild oat	7	9	8	8

Table A	COMPOUND							
Rate 2000 g/ha	1	2	3	4	5	6	7	11
PREEMERGENCE								
B. signalgrass	-	-	-	-	-	-	-	-
Barley	6	0	0	2	5	8	1	2
Barnyardgrass	9	0	9	9	9	10	3	9
Bedstraw	8	1	8	4	10	8	3	8
Blackgrass	10	0	8	10	9	10	4	10

Table A	COMPOUND			
Rate 1000 g/ha	13	14	19	49
PREEMERGENCE				
B. signalgrass	10	10	10	10
Barley	-	-	-	-
Barnyardgrass	-	-	-	-
Bedstraw	10	10	9	10
Blackgrass	10	10	9	10

Chickweed	9	4	5	8	10	10	2	9	Chickweed	-	-	-	-
Cocklebur	0	0	0	0	3	2	0	0	Cocklebur	8	7	2	6
Corn	2	0	0	1	2	3	0	1	Corn	5	4	7	7
Cotton	3	2	2	1	7	4	0	0	Cotton	-	-	-	-
Crabgrass	10	1	9	10	10	10	9	10	Crabgrass	10	10	10	10
Downy brome	10	0	2	7	9	10	2	5	Downy brome	-	-	-	-
Giant foxtail	10	2	9	10	10	10	9	10	Giant foxtail	10	10	10	10
Lambsquarters	9	9	9	9	10	10	8	10	Lambsquarters	-	-	-	-
Morningglory	3	1	2	4	8	10	3	3	Morningglory	10	10	10	10
Nutsedge	-	0	0	0	0	-	-	-	Nutsedge	0	1	0	1
Rape	8	2	2	4	9	10	6	7	Rape	10	10	10	10
Redroot pigweed	-	-	-	-	-	-	-	-	Redroot pigweed	10	10	10	10
Rice	2	0	0	0	2	1	0	0	Rice	-	-	-	-
Sorghum	7	0	0	2	1	4	0	4	Sorghum	-	-	-	-
Soybean	1	0	0	0	2	4	0	1	Soybean	6	5	3	7
Sugar beet	10	0	3	9	10	10	6	10	Sugar beet	10	10	10	10
Velvetleaf	2	0	0	1	10	10	2	2	Velvetleaf	10	10	10	10
Wheat	9	0	0	2	7	9	0	1	Wheat	7	9	2	7
Wild buckwheat	5	1	1	6	9	10	2	8	Wild buckwheat	-	-	-	-
Wild oat	10	3	7	9	9	10	5	10	Wild oat	10	10	10	10

Table A	COMPOUND									
Rate 400 g/ha	1	2	3	4	5	6	7	8	10	11
POSTEMERGENCE										
B. signalgrass	-	-	-	-	-	-	-	-	-	-
Barley	3	2	2	3	3	3	3	0	3	2
Barnyardgrass	2	2	2	2	7	3	2	0	0	2
Bedstraw	9	7	8	7	7	8	9	1	7	2
Blackgrass	3	3	2	3	4	3	2	0	3	1
Chickweed	5	5	2	4	7	8	5	0	4	3
Cocklebur	6	5	4	6	7	5	5	0	5	4
Corn	2	1	2	2	2	2	0	0	1	2
Cotton	-	6	7	8	9	9	9	0	3	8
Crabgrass	5	3	4	7	7	9	3	0	2	6
Downy brome	1	3	1	2	3	3	2	0	2	0
Giant foxtail	2	3	2	3	6	6	2	0	1	3
Lambsquart rs	8	8	6	9	9	9	7	0	3	9
Morningglory	8	4	8	7	8	9	7	1	2	7

Nutsedge	1	0	0	0	0	2	0	0	0	0
Rape	6	7	6	8	7	10	8	1	6	8
Redroot pigweed	-	-	-	-	-	-	-	-	-	-
Rice	2	2	2	2	2	2	1	0	1	2
Sorghum	3	1	0	1	2	3	2	0	0	2
Soybean	6	3	3	5	7	9	4	2	2	6
Sugar beet	9	8	9	9	9	9	8	1	7	9
Velvetleaf	2	6	5	1	8	8	2	0	2	1
Wheat	0	2	1	3	2	1	2	0	1	0
Wild buckwheat	7	7	2	9	4	8	7	1	0	3
Wild oat	3	2	1	2	3	4	2	0	2	2

Table A	COMPOUND									
Rate 400 g/ha	1	2	3	4	5	6	7	8	10	11
PREEMERGENCE										
B. signalgrass	-	-	-	-	-	-	-	-	-	-
Barley	1	0	0	0	2	4	0	0	0	0
Barnyardgrass	3	0	0	0	5	5	0	2	1	4
Bedstraw	3	0	0	-	6	8	0	0	0	0
Blackgrass	9	0	0	2	3	9	0	0	0	8
Chickweed	9	0	0	0	10	9	0	0	0	8
Cocklebur	0	0	0	0	1	0	0	0	0	0
Corn	0	0	0	0	0	1	0	0	0	0
Cotton	-	0	0	0	-	1	0	0	0	0
Crabgrass	9	0	3	6	9	10	3	2	8	9
Downy brome	6	0	0	0	4	6	0	0	0	1
Giant foxtail	10	1	4	6	7	10	4	0	3	9
Lambsquarters	9	3	0	0	9	10	2	0	0	9
Morningglory	2	0	0	0	8	6	0	0	0	2
Nutsedge	0	0	-	-	0	-	-	-	0	0
Rape	2	0	0	0	8	9	0	0	0	3
Redroot pigweed	-	-	-	-	-	-	-	-	-	-
Rice	0	0	0	0	0	0	0	2	0	0
Sorghum	2	0	0	0	0	2	0	0	0	2
Soybean	0	0	0	0	1	2	0	0	0	0
Sugar b et	7	0	0	3	9	10	0	0	0	6
Velvetleaf	0	0	0	0	7	7	0	0	1	0
Wheat	2	0	0	0	2	3	0	0	0	0

Wild buckwheat	0	0	0	0	5	6	0	0	0	2
Wild oat	9	0	0	3	8	10	0	0	0	7

Table A	COMPOUND				
Rate 200 g/ha	12	13	14	19	49
POSTEMERGENCE					
B. signalgrass	-	4	3	4	5
Barley	4	-	-	-	-
Barnyardgrass	9	-	-	-	-
Bedstraw	9	9	10	9	9
Blackgrass	4	6	8	4	7
Chickweed	8	-	-	-	-
Cocklebur	9	6	10	8	9
Corn	5	4	2	3	3
Cotton	10	-	-	-	-
Crabgrass	9	8	10	8	9
Downy brome	6	-	-	-	-
Giant foxtail	8	9	6	8	9
Lambsquarters	9	-	-	-	-
Morningglory	9	8	10	8	9
Nutsedge	2	1	3	0	1
Rape	10	10	10	9	10
Redroot pigweed	-	9	10	9	9
Rice	3	-	-	-	-
Sorghum	4	-	-	-	-
Soybean	9	8	10	8	10
Sugar beet	9	9	10	9	9
Velvetleaf	9	9	9	7	9
Wheat	3	3	3	1	2
Wild buckwheat	8	-	-	-	-
Wild oat	7	3	5	4	4

Table A	COMPOUND				
Rate 200 g/ha	12	13	14	19	49
PREEMERGENCE					
B. signalgrass	-	10	9	8	10
Barley	5	-	-	-	-
Barnyardgrass	10	-	-	-	-
Bedstraw	7	8	10	10	9
Blackgrass	10	10	10	9	10
Chickweed	9	-	-	-	-
Cocklebur	2	8	4	1	2
Corn	3	4	2	4	3
Cotton	4	-	-	-	-
Crabgrass	10	10	10	10	10
Downy brome	10	-	-	-	-
Giant foxtail	10	10	10	10	10
Lambsquarters	10	-	-	-	-
Morningglory	8	6	10	9	5
Nutsedge	0	0	0	0	0
Rape	9	9	10	8	9
Redroot pigweed	-	10	10	10	10
Rice	2	-	-	-	-
Sorghum	7	-	-	-	-
Soybean	0	2	4	1	4
Sugar beet	10	10	10	10	10
Velvetleaf	10	9	8	9	10
Wheat	4	3	3	1	2
Wild buckwheat	4	-	-	-	-
Wild oat	10	10	9	8	10

Table A	COMPOUND	
Rate 100 g/ha	8	10
POSTEMERGENCE		
B. signalgrass	-	-
Barley	0	2
Barnyardgrass	0	0

Table A	COMPOUND	
Rate 100 g/ha	8	10
PREEMERGENCE		
B. signalgrass	-	-
Barley	0	0
Barnyardgrass	0	0

Table A	COMPOUND	
Rate 50 g/ha	9	12
POSTEMERGENCE		
B. signalgrass	-	-
Barley	0	3
Barnyardgrass	0	5

Bedstraw	0	4	Bedstraw	0	0	Bedstraw	3	9
Blackgrass	0	2	Blackgrass	0	0	Blackgrass	0	3
Chickweed	0	2	Chickweed	0	0	Chickweed	3	7
Cocklebur	0	3	Cocklebur	0	0	Cocklebur	2	7
Corn	0	0	Corn	0	0	Corn	1	3
Cotton	0	1	Cotton	0	0	Cotton	2	10
Crabgrass	0	1	Crabgrass	0	0	Crabgrass	0	8
Downy brome	0	1	Downy brome	0	0	Downy brome	0	6
Giant foxtail	0	1	Giant foxtail	0	0	Giant foxtail	0	4
Lambsquarters	0	2	Lambsquarters	0	0	Lambsquarters	1	9
Morningglory	0	2	Morningglory	0	0	Morningglory	2	8
Nutsedge	0	0	Nutsedge	0	0	Nutsedge	0	0
Rape	0	5	Rape	0	0	Rape	3	10
Redroot pigweed	-	-	Redroot pigweed	-	-	Redroot pigweed	-	-
Rice	0	0	Rice	0	0	Rice	0	2
Sorghum	0	0	Sorghum	0	0	Sorghum	0	2
Soybean	0	1	Soybean	0	0	Soybean	1	8
Sugar beet	0	4	Sugar beet	0	0	Sugar beet	2	9
Velvetleaf	0	1	Velvetleaf	0	0	Velvetleaf	0	8
Wheat	0	0	Wheat	0	0	Wheat	0	2
Wild buckwheat	0	0	Wild buckwheat	0	0	Wild buckwheat	1	8
Wild oat	0	1	Wild oat	0	0	Wild oat	0	3

Table A	COMPOUND	
Rate	50 g/ha	9 12
PREEMERGENCE		
B. signalgrass	-	-
Barley	0	1
Barnyardgrass	0	8
Bedstraw	0	5
Blackgrass	0	8
Chickweed	0	9
Cocklebur	0	2
Corn	0	2
Cotton	0	1
Crabgrass	0	10
Downy brome	0	7
Giant foxtail	0	10
Lambsquarters	0	9
Morningglory	0	5
Nutsedge	0	0
Rape	0	7
Redroot pigweed	-	-
Rice	0	1
Sorghum	0	3
Soybean	0	0
Sugar beet	0	9
Velvetleaf	0	10
Wheat	0	1
Wild buckwheat	0	3
Wild oat	0	9

Table A	COMPOUND			
Rate 1000 g/ha	13	14	19	49
SPRAYED PADDY				
Barnyardgrass	9	9	8	9
Ducksalad	8	7	6	9
Rice	9	5	6	9
S. flatsedge	9	9	8	9

Table A	COMPOUND			
Rate 200 g/ha	13	14	19	49
SPRAYED PADDY				
Barnyardgrass	8	6	7	9
Ducksalad	5	7	4	5
Rice	5	3	5	7
S. flatsedge	8	8	8	9

TEST B

Seeds of broadleaf signalgrass (*Brachiaria decumbens*), bedstraw (*Galium aparine*), blackgrass (*Alopecurus myosuroides*), cocklebur (*Xanthium strumarium*), corn (*Zea mays*), crabgrass (*Digitaria sanguinalis*), giant foxtail (*Setaria faberii*), morningglory (*Ipomoea hederacea*), rape (*Brassica napus*), redroot pigweed (*Amaranthus retroflexus*), soybean (*Glycine max*), sugar beet (*Beta vulgaris*), velvetleaf (*Abutilon theophrasti*), wheat (*Triticum aestivum*), wild oat (*Avena fatua*) and purple nutsedge (*Cyperus rotundus*) tubers were planted and treated preemergence with test chemicals formulated in a non-phytotoxic solvent mixture which included a surfactant.

At the same time, these crop and weed species were also treated with postemergence applications of test chemicals formulated in the same manner. Plants ranged in height from 2 to 18 cm (1- to 4-leaf stage) for postemergence treatments. Plant species in the flood test consisted of rice (*Oryza sativa*), smallflower flatsedge (*Cyperus difformis*), duck salad (*Heteranthera limosa*) and barnyardgrass (*Echinochloa crus-galli*) grown to the 2-leaf stage for testing. Treated plants and controls were maintained in a greenhouse for twelve to sixteen days, after which all species were compared to controls and visually evaluated. Plant response ratings, summarized in Table B, are based on a scale of 0 to 10 where 0 is no effect and 10 is complete control. A dash (-) response means no test result.

Table B	COMPOUND	
Rate 1000 g/ha	5	26
Postemergence		
B. signalgrass	3	8
Barnyardgrass	8	6
Blackgrass	5	9
Cocklebur	8	10
Corn	3	6
Crabgrass	10	8
Ducksalad	7	6
Galium	10	10

Table B	COMPOUND	
Rate 1000 g/ha	5	26
Preemergence		
B. signalgrass	9	9
Blackgrass	9	10
Cocklebur	2	8
Corn	3	3
Crabgrass	10	10
Galium	10	7
Giant foxtail	10	10
Morningglory	10	10

Giant foxtail	7	8
Morningglory	9	9
Nutsedge	0	2
Rape	10	10
Redroot pigweed	10	9
Rice	5	5
S. Flatsedge	8	9
Soybean	6	9
Sugarbeets	10	10
Velvetleaf	8	10
Wheat	4	3
Wild oats	5	7
Nutsedge	10	0
Rape	10	10
Redroot pigweed	10	10
Soybean	1	8
Sugarbeets	10	10
Velvetleaf	9	10
Wheat	4	2
Wild oats	10	9

Table B	COMPOUND							
Rate 500 g/ha	5	15	20	21	26	29	30	31
Postemergence								
B. signalgrass	2	3	3	-	8	6	9	2
Barnyardgrass	6	0	6	0	6	7	6	4
Blackgrass	2	3	8	9	8	9	6	2
Cocklebur	6	6	9	9	9	9	8	9
Corn	2	2	6	2	4	3	3	2
Crabgrass	4	6	9	8	8	9	9	8
Ducksalad	6	2	5	2	4	8	4	1
Galium	10	5	9	9	10	9	10	7
Giant foxtail	3	3	9	7	8	9	9	6
Morningglory	9	8	10	8	9	10	8	9
Nutsedge	0	0	1	0	2	-	0	2
Rape	10	8	9	9	10	9	10	8
Redroot pigweed	10	9	9	9	9	9	10	9
Rice	4	2	7	3	4	5	5	3
S. Flatsedge	7	4	9	8	9	9	9	9
Soybean	5	6	9	1	8	9	9	8
Sugarbeets	10	8	10	9	10	9	10	9
Velvetleaf	7	4	10	5	10	10	9	8
Wheat	3	3	5	2	3	3	4	2
Wild oats	3	4	6	3	5	6	6	2

Table B	COMPOUND							
Rate 500 g/ha	5	15	20	21	26	29	30	31
Preemergence								
B. signalgrass	9	5	10	-	9	10	9	3
Blackgrass	8	5	10	9	9	10	8	1
Cocklebur	0	0	9	1	8	9	7	3
Corn	0	0	3	1	2	3	1	0
Crabgrass	10	10	10	10	10	10	10	10
Galium	9	8	9	9	7	10	8	0
Giant foxtail	10	10	10	10	10	10	10	1
Morningglory	8	-	10	8	10	10	10	10
Nutsedge	3	0	-	0	0	1	0	0
Rape	9	8	10	9	10	10	7	3
Redroot pigweed	10	9	10	10	10	10	10	8
Soybean	0	0	7	0	6	3	4	1
Sugarbeets	10	8	10	10	10	10	10	10
Velvetleaf	8	2	10	7	9	10	10	10
Wheat	2	0	8	1	2	9	3	1
Wild oats	8	7	10	9	9	10	9	1

Table B	COMPOUND																														
Rate 250 g/ha	5	12	13	14	15	16	17	19	20	21	22	23	24	25	26	27	28	29	30	31	34	35	36	37	38	39	40	41	44		
Postemergence																															
B. signalgrass	2	-	4	3	3	8	3	3	2	-	-	3	8	6	7	3	9	4	8	2	3	4	8	7	2	5	5	2	-		
Barnyardgrass	5	6	5	5	0	7	4	7	6	0	5	3	5	7	4	4	6	6	4	3	6	7	9	9	2	7	3	4	4		
Blackgrass	2	9	8	6	2	9	7	4	6	6	8	4	8	8	6	7	8	5	3	1	4	4	8	7	2	6	7	2	-		
Cocklebur	6	9	9	9	6	10	9	8	9	9	9	8	8	9	9	8	9	9	8	-	8	9	9	9	2	8	10	8	-		
Corn	2	3	4	3	2	6	4	3	3	1	1	2	5	4	4	3	5	3	3	2	2	3	4	5	1	3	4	2	-		
Crabgrass	4	9	9	9	5	9	9	7	9	7	9	8	9	5	5	5	9	6	9	2	7	9	9	9	2	8	9	8	-		
Ducksalad	6	9	6	3	0	9	8	4	4	0	3	6	7	8	2	5	6	8	2	1	6	4	8	9	3	5	4	4	9		
Galium	7	9	9	9	4	-	10	9	9	8	9	9	9	9	7	9	10	9	10	7	9	-	9	9	-	10	-	10	-		
Giant foxtail	3	9	9	9	3	9	9	7	8	7	7	8	9	5	5	4	10	5	8	3	8	6	8	9	2	9	9	7	-		
Morningglory	10	10	8	10	7	10	9	2	10	8	9	9	10	10	9	4	10	9	8	9	8	9	10	8	5	8	9	7	-		
Nutsedge	0	2	3	2	0	0	0	0	0	0	0	0	1	4	1	1	3	-	0	1	2	0	2	0	0	2	3	0	-		
Rape	8	10	9	10	8	9	10	7	10	9	10	8	10	10	10	10	10	9	10	8	9	9	9	9	3	10	10	4	-		
Redroot pigweed	9	9	9	9	9	9	9	9	9	7	10	9	10	9	9	10	9	9	10	9	9	9	8	9	8	10	9	8	-		
Rice	3	6	5	6	0	8	3	7	6	2	3	2	6	5	3	3	5	4	5	2	2	3	7	7	1	6	4	4	4		
S. Flatsedge	7	9	9	9	3	9	9	9	9	8	3	8	9	9	8	6	9	8	8	9	8	9	9	9	6	9	9	9	9		
Soybean	4	9	9	8	5	9	7	6	8	1	9	6	9	10	8	8	10	8	9	8	10	10	10	10	6	8	9	1	-		
Sugarbeets	9	9	9	9	8	9	10	9	10	9	9	9	10	10	10	10	10	9	10	9	9	9	9	8	7	10	10	8	-		
Velvetleaf	7	9	9	9	3	9	8	7	9	5	9	6	9	9	9	8	9	9	8	6	9	9	9	9	3	8	8	2	-		
Wheat	2	2	4	3	2	3	1	2	2	1	3	2	2	4	2	2	3	3	3	2	1	1	4	4	1	3	4	2	-		
Wild oats	2	6	4	5	3	5	4	3	4	3	7	3	5	6	3	5	6	5	5	1	3	3	6	6	2	5	5	3	-		

Table B	COMPOUND								
Rate 250 g/ha	45	46	49	51	52	53	54	56	57
Postemergence									
B. signalgrass	4	8	5	-	-	-	-	3	2
Barnyardgrass	6	5	6	0	6	1	3	7	4
Blackgrass	6	6	8	3	6	6	4	8	3
Cocklebur	6	9	10	6	7	6	8	7	8
Corn	4	4	4	3	6	1	4	7	2
Crabgrass	-	10	10	6	9	1	3	6	4
Ducksalad	5	2	8	0	4	0	2	9	6
Galium	7	9	9	9	9	7	8	9	9
Giant foxtail	6	8	10	4	9	1	2	9	6
Morningglory	10	10	9	4	9	7	6	9	-
Nutsedge	0	0	2	0	1	0	1	1	0
Rape	9	10	9	7	7	1	6	9	10
Redroot pigweed	9	10	9	9	9	8	9	10	9
Rice	3	5	6	0	5	0	2	8	4
S. Flatsedge	9	8	9	0	9	5	6	9	9
Soybean	-	7	9	5	8	2	7	6	4
Sugarbeets	9	10	9	8	9	7	9	9	9
Velvetleaf	8	8	9	3	6	5	7	9	7
Wheat	2	3	3	3	3	1	2	1	1
Wild oats	4	5	5	2	9	1	3	4	2

Table B	COMPOUND																													
Rate 250 g/ha	5	12	13	14	15	16	17	19	20	21	22	23	24	25	26	27	28	29	30	31	34	35	36	37	38	39	40	41	45
Preemergence																													
B. signalgrass	5	-	10	-	3	10	8	8	-	-	-	9	10	10	7	8	10	10	8	1	8	8	-	-	2	9	9	8	9
Blackgrass	1	10	10	9	1	10	10	6	9	7	9	9	10	10	7	8	10	10	7	0	9	9	10	10	1	6	8	10	10
Cocklebur	0	9	8	6	0	7	4	3	7	0	2	8	10	8	3	3	2	5	-	-	3	7	7	8	0	-	10	3	0
Corn	0	3	4	1	0	4	2	3	1	1	1	1	5	2	1	0	1	2	1	0	1	1	5	4	0	1	1	1	0
Crabgrass	8	10	10	10	2	10	10	10	10	10	10	10	10	10	9	9	10	10	10	9	9	10	10	10	4	10	10	10	10
Galium	9	9	8	8	4	10	10	7	9	1	8	10	8	10	7	9	9	9	8	0	9	8	10	9	0	9	10	9	1
Giant foxtail	9	10	10	10	7	10	10	10	10	10	10	10	10	10	9	9	10	10	10	9	10	10	10	10	4	10	10	10	9
Morningglory	9	10	10	10	0	10	10	10	10	8	9	10	10	10	9	5	10	10	10	10	10	10	10	10	1	10	10	6	10
Nuts dge	0	1	0	0	0	-	0	0	0	0	0	1	0	4	0	-	5	1	-	0	1	1	1	-	0	-	1	-	0
Rape	8	10	10	10	5	10	10	9	10	8	10	10	10	10	9	9	9	10	7	1	10	9	10	10	1	10	9	7	7
Redroot pigweed	10	10	10	10	5	10	10	9	10	10	10	10	10	10	10	10	10	10	10	6	10	10	10	10	8	10	10	10	10
Soybean	0	5	5	2	0	4	3	3	4	0	2	2	8	3	5	1	3	2	3	0	1	4	2	2	0	4	3	1	2
Sugarb ets	9	10	10	10	7	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	7	10	10	10	10
V lvetleaf	8	10	10	10	0	10	10	10	10	2	10	10	10	10	8	10	10	10	8	8	10	7	10	10	2	10	10	1	10
Wheat	0	3	4	5	0	4	2	2	4	0	6	3	6	1	1	3	1	3	2	0	2	3	4	5	0	2	4	4	0
Wild oats	6	10	10	10	2	10	8	8	9	7	10	8	10	10	8	8	10	10	8	1	8	9	10	10	2	9	9	8	10

Table B	COMPOUND							
Rate 250 g/ha	46	49	51	52	53	54	56	57
Preemergence								
B. signalgrass	9	10	3	-	-	-	9	8
Blackgrass	8	10	5	-	2	2	9	7
Cocklebur	2	8	2	7	0	2	3	0
Corn	1	5	0	5	0	0	4	0
Crabgrass	9	10	9	9	3	9	10	10
Galium	4	9	9	9	7	8	9	8
Giant foxtail	9	10	9	10	2	3	10	9
Morningglory	9	10	10	8	6	7	10	10
Nutsedge	0	1	0	0	0	0	0	-
Rape	7	10	8	9	1	2	10	10
Redroot pigweed	9	10	10	10	9	6	10	10
Soybean	1	5	1	2	0	1	1	1
Sugarbeets	10	10	10	10	8	9	10	10
Velvetleaf	9	10	5	8	0	7	10	7
Wheat	4	4	3	3	0	1	4	1
Wild oats	9	10	3	9	2	4	10	9

Table B	COMPOUND																														
Rate 125 g/ha	5	12	13	14	15	16	17	19	20	21	22	23	24	25	26	27	28	29	30	31	34	35	36	37	38	39	40	41	44
Postemergence																													
B. signalgrass	1	-	3	3	3	6	2	2	2	-	-	3	6	4	4	3	6	3	8	2	3	3	6	6	1	5	4	1	5
Barnyardgrass	3	5	4	4	0	6	3	5	5	0	4	2	4	6	4	3	5	4	4	3	5	4	8	8	1	6	3	3	3
Blackgrass	1	7	6	5	2	8	5	4	5	-	7	3	3	7	3	7	6	3	3	1	3	4	7	6	1	5	6	1	5
Cocklebur	6	8	9	9	5	10	9	7	8	-	8	8	8	9	9	8	8	8	8	8	7	9	9	9	2	8	9	6	-
Corn	2	2	2	2	2	4	4	1	3	-	1	1	5	4	3	3	3	3	3	2	2	3	4	5	1	2	3	1	4
Crabgrass	3	9	8	9	4	9	7	4	9	-	8	5	8	5	5	5	8	3	8	1	7	6	9	9	1	7	7	7	8
Ducksalad	4	9	-	3	0	8	8	2	3	0	2	4	6	7	2	4	4	7	0	0	3	3	5	9	2	4	3	3	8
Galium	7	9	9	9	4	10	10	8	9	-	9	-	9	9	7	-	10	9	10	4	9	-	9	9	7	10	-	8	9
Giant foxtail	2	8	7	3	2	9	8	5	4	-	4	6	9	5	5	4	6	3	4	3	5	3	8	9	1	7	6	3	8
Morningglory	7	10	8	10	6	9	9	2	9	-	9	7	9	10	6	4	10	6	8	9	8	9	9	8	2	8	9	3	9
Nutsedge	0	1	1	1	0	0	0	0	0	-	0	0	0	3	0	0	1	0	0	0	1	0	2	0	0	1	0	0	0
Rape	6	10	9	10	7	9	9	7	10	-	10	7	10	10	10	10	10	9	9	7	9	9	9	9	3	10	10	2	8
R droot pigweed	8	9	9	9	9	9	9	9	9	-	9	9	10	9	9	10	9	9	8	9	9	9	8	8	5	10	9	8	9
Rice	1	5	4	5	0	6	3	5	5	0	2	1	5	4	2	2	4	3	5	2	2	1	6	6	0	6	3	2	3
S. Flatsedge	7	9	9	3	2	9	9	7	9	5	2	7	8	8	8	4	9	8	7	7	7	6	9	9	5	8	9	7	9
Soybean	4	8	8	8	5	9	7	4	8	-	7	5	8	9	8	8	8	8	9	7	9	10	10	9	3	8	8	0	9
Sugarbeets	9	9	9	9	8	9	9	9	10	-	9	9	10	9	10	9	10	9	10	8	9	9	9	8	4	10	9	8	10
Velvetleaf	7	9	9	9	3	9	8	3	9	-	9	6	9	9	9	8	9	8	8	6	9	9	9	8	2	8	8	0	9
Wheat	2	2	3	2	1	2	1	2	2	-	1	1	1	3	2	2	3	3	2	2	1	1	3	4	1	2	3	1	4
Wild oats	2	3	4	4	3	4	2	2	3	-	7	3	4	5	3	5	5	4	3	1	2	3	6	5	1	5	4	2	4

Table B	COMPOUND								
Rate 125 g/ha	45	46	49	51	52	53	54	56	57
Postemergence									
B. signalgrass	4	8	4	-	-	-	-	3	1
Barnyardgrass	3	4	5	0	5	0	2	7	4
Blackgrass	5	5	6	3	5	4	3	7	2
Cocklebur	4	9	10	5	5	6	8	6	7
Corn	4	3	3	2	5	0	3	5	2
Crabgrass	6	8	9	3	5	1	3	4	3
Ducksalad	5	2	8	0	3	0	2	9	5
Galium	7	9	9	8	8	8	8	9	9
Giant foxtail	4	6	9	1	8	1	2	7	6
Morningglory	10	10	8	3	8	6	6	9	9
Nutsedge	0	0	2	0	0	0	0	0	0
Rape	8	8	9	7	7	0	5	9	8
Redroot pigweed	9	10	9	9	9	7	9	9	9
Rice	3	4	5	0	4	0	0	8	4
S. Flatsedge	9	7	8	0	9	4	5	9	9
Soybean	9	7	8	4	6	0	4	6	2
Sugarbeets	9	10	9	8	9	7	9	9	9
Velvetleaf	7	8	9	3	6	2	6	8	7
Wheat	2	3	2	2	3	1	1	1	1
Wild oats	3	4	5	2	4	1	2	4	2

Table B	COMPOUND																														
Rate 125 g/ha	5	12	13	14	15	16	17	19	20	22	23	24	25	26	27	28	29	30	31	34	35	36	37	38	39	40	41	44	45
Preemergence																													
B. signalgrass	2	-	10	-	1	10	8	7	-	-	8	9	10	5	8	10	9	8	1	8	6	-	-	1	7	9	7	7	8
Blackgrass	0	7	9	9	1	10	6	3	9	8	7	8	9	5	5	9	9	3	0	8	5	10	10	0	6	6	7	2	5
Cocklebur	0	6	-	3	0	2	4	0	7	0	6	8	7	-	1	1	1	-	0	-	1	2	3	0	7	6	1	0	-
Corn	0	2	2	1	0	2	0	2	1	1	1	3	1	0	0	1	2	1	0	1	1	2	2	0	0	1	1	2	0
Crabgrass	4	10	10	10	1	10	10	9	10	10	10	10	10	9	9	9	10	9	6	9	10	10	10	1	9	10	10	10	10
Galium	6	6	8	8	3	10	10	7	9	7	8	8	10	4	7	3	9	7	0	6	8	10	9	0	8	8	6	5	1
Giant foxtail	5	10	10	9	3	10	10	9	10	10	10	10	10	9	9	10	10	10	8	9	10	10	10	3	10	10	10	10	9
Morningglory	2	10	10	10	0	10	10	9	10	6	8	10	10	5	5	10	10	10	6	6	9	10	9	0	10	10	3	9	9
Nutsedge	0	0	0	0	0	0	0	0	0	0	0	0	1	0	-	1	-	0	0	0	1	-	0	0	-	1	0	0	0
Rape	7	9	10	8	5	10	10	8	9	9	10	10	10	8	6	8	10	7	1	9	8	10	10	0	7	9	4	8	4
Redroot pigweed	9	10	10	9	1	10	10	9	10	10	10	10	10	8	7	10	10	10	5	10	10	10	10	0	9	8	10	9	9
Soybean	0	4	3	2	0	4	1	1	2	1	1	7	2	4	1	2	2	3	0	1	2	2	1	0	3	3	0	5	1
Sugarb ets	8	10	10	10	3	10	10	10	10	9	10	10	10	10	9	10	10	10	3	10	9	10	10	2	10	10	5	10	10
Velvetleaf	2	10	10	7	0	10	10	7	10	7	8	10	9	8	7	10	10	7	4	8	9	10	8	1	9	10	0	10	7
Wheat	0	2	2	3	0	2	1	0	3	3	2	3	1	1	1	0	3	2	0	2	1	2	3	0	1	3	2	2	0
Wild oats	4	10	9	9	0	10	7	5	8	9	8	9	10	7	6	10	9	8	0	8	7	10	10	2	9	9	7	5	9

Table B	COMPOUND							
Rate 125 g/ha	46	49	51	52	53	54	56	57
Preemergence								
B. signalgrass	9	10	1	-	-	-	7	7
Blackgrass	5	10	1	7	2	2	4	2
Cocklebur	1	2	1	2	0	1	0	0
Corn	1	3	0	5	0	0	2	0
Crabgrass	7	10	6	9	0	6	10	9
Galium	3	9	7	9	3	6	8	7
Giant foxtail	9	10	9	10	1	3	10	9
Morningglory	6	10	5	8	0	7	10	10
Nutsedge	0	1	0	0	-	0	-	0
Rape	6	10	7	9	0	0	10	9
Redroot pigweed	9	10	7	10	3	6	10	10
Soybean	1	3	0	0	0	0	1	0
Sugarbeets	10	10	10	10	3	9	10	9
Velvetleaf	9	10	5	6	0	7	10	7
Wheat	3	1	1	3	0	0	3	1
Wild oats	7	10	2	9	2	1	10	9

Table B	COMPOUND																														
Rat 62 g/ha	12	13	14	15	16	17	19	20	21	22	23	24	25	27	28	29	30	31	34	35	36	37	38	39	40	41	44	45	46		
Postemergence																															
B. signalgrass	-	2	3	3	3	2	1	1	-	-	2	3	4	2	6	3	8	2	3	3	5	5	1	3	3	1	3	4	7		
Barnyardgrass	5	4	4	0	4	3	4	4	0	4	2	3	5	2	4	3	4	3	4	4	7	5	0	4	2	3	3	3	3		
Blackgrass	4	5	4	1	3	3	2	3	3	6	3	3	5	7	4	2	2	1	3	2	7	4	1	2	5	1	3	4	3		
Cocklebur	8	9	9	4	6	8	7	8	7	7	8	7	9	7	7	8	7	8	7	8	9	9	2	8	8	-	-	4	9		
Corn	2	2	2	2	2	2	1	2	1	1	1	3	4	2	3	2	3	2	2	2	3	4	1	2	3	1	4	3	3		
Crabgrass	7	8	4	3	9	6	3	6	2	6	4	8	3	3	7	3	6	2	5	5	8	5	0	3	5	3	5	2	3		
Ducksalad	9	2	0	0	8	2	0	2	0	0	1	5	4	3	4	6	0	0	1	2	4	4	0	3	2	2	6	0	1		
Galium	9	9	8	4	10	-	7	8	7	9	-	9	9	10	9	8	10	2	9	9	8	8	1	10	-	8	9	4	9		
Giant foxtail	5	7	2	2	8	6	3	2	2	4	6	7	3	2	5	2	5	2	5	3	7	4	1	6	6	2	6	2	3		
Morningglory	10	8	9	2	8	9	2	9	7	8	-	7	9	-	8	3	8	8	8	8	8	7	1	7	9	3	8	10	7		
Nutsedge	1	-	1	0	0	0	0	0	0	0	0	0	3	-	0	-	0	0	1	0	2	0	0	0	0	0	-	0	0		
Rape	10	9	9	6	9	7	6	8	9	10	-	9	9	10	10	8	9	5	9	9	9	9	3	10	10	2	8	8	8		
Redroot pigweed	9	9	8	8	9	9	9	9	4	9	9	10	9	10	9	9	8	8	9	9	8	8	-	10	9	7	9	9	9		
Ric	4	3	4	0	6	2	3	4	0	2	1	5	3	1	4	3	4	1	1	1	5	5	0	5	2	1	3	1	3		
S. Flatsedge	9	8	3	0	9	8	7	8	3	2	7	8	8	-	9	4	5	6	5	5	9	8	2	8	6	7	9	8	7		
Soybean	6	6	8	5	7	6	4	7	0	7	3	8	8	7	8	8	9	4	10	8	9	9	1	8	8	0	9	9	7		
Sugarb ets	9	9	8	8	8	9	9	8	6	9	9	10	9	9	9	9	9	8	9	9	9	8	4	10	9	6	10	9	10		
Velvetleaf	9	9	8	3	7	7	3	8	1	9	6	9	9	8	8	8	8	6	9	9	8	8	1	8	7	0	8	7	8		
Wheat	1	2	1	0	1	1	1	1	1	1	1	1	3	1	3	3	1	1	1	1	3	4	0	2	3	1	2	1	3		
Wild oats	2	4	3	1	3	2	2	2	2	6	3	2	5	3	4	3	3	1	2	2	5	4	1	2	4	1	2	3	4		

Table B	COMPOUND						
Rate 62 g/ha	49	51	52	53	54	56	57
Postemergence							
B. signalgrass	3	-	-	-	-	2	1
Barnyardgrass	5	0	4	0	1	6	2
Blackgrass	5	2	5	1	3	3	2
Cocklebur	9	4	5	3	6	6	6
Corn	3	2	3	0	1	3	2
Crabgrass	9	2	4	0	2	3	3
Ducksalad	6	0	0	0	0	8	3
Galium	9	8	8	7	8	9	8
Giant foxtail	8	1	5	1	1	7	4
Morningglory	8	3	6	1	6	9	9
Nutsedge	2	0	0	0	0	0	0
Rape	8	7	7	0	4	9	8
Redroot pigweed	9	9	9	5	6	9	9
Rice	4	0	3	0	0	7	3
S. Flatsedge	8	0	5	2	5	9	8
Soybean	8	4	5	0	4	5	2
Sugarbeets	9	7	9	6	9	9	9
Velvetleaf	9	3	6	2	6	6	7
Wheat	2	2	3	0	1	0	1
Wild oats	5	2	4	0	2	3	1

Table B	COMPOUND																													
Rate 62 g/ha	12	13	14	15	16	17	19	20	21	22	23	24	25	27	28	29	30	31	34	35	36	37	38	40	41	44	45	46	49
Pr emergence																													
B. signalgrass	-	9	-	0	9	5	5	-	-	-	7	9	9	6	9	9	7	0	7	3	-	-	0	8	4	5	8	5	10
Blackgrass	7	7	6	0	6	3	2	4	2	3	6	6	8	3	6	5	1	0	3	3	9	10	0	5	3	2	3	3	10
Cocklebur	2	5	1	0	1	3	0	3	0	0	5	1	7	0	-	1	-	0	0	1	2	3	0	6	0	0	0	1	1
Corn	1	1	0	0	1	0	0	0	0	0	1	1	1	0	1	1	0	0	1	1	1	1	0	1	0	0	0	0	2
Crabgrass	10	10	9	1	10	9	8	8	2	10	9	10	9	4	8	10	8	2	9	9	10	10	1	9	8	9	8	7	10
Galium	6	7	8	3	10	9	-	8	0	7	8	7	8	5	3	8	6	0	6	7	8	8	0	8	6	3	0	2	9
Giant foxtail	10	10	9	1	10	9	7	8	9	10	9	10	10	7	10	10	9	4	9	8	10	10	2	9	9	9	4	9	10
Morningglory	7	10	8	0	10	6	9	8	1	4	4	10	8	5	10	9	7	5	4	5	8	8	0	8	3	8	3	3	10
Nutsedge	0	0	0	0	0	0	0	0	0	0	0	0	1	-	0	0	0	0	0	-	0	-	0	0	0	0	0	0	0
Rape	9	10	8	0	10	10	4	9	8	8	10	10	7	5	8	7	3	1	8	8	9	8	0	9	2	8	0	5	10
Redroot pigweed	10	10	9	1	10	10	9	10	10	10	8	10	9	3	9	10	8	2	8	10	10	10	0	8	9	9	9	9	10
Soybean	3	1	1	0	1	1	0	1	0	1	1	2	1	1	1	1	1	0	0	1	1	1	0	1	0	1	0	0	1
Sugarbeets	10	10	6	2	10	10	10	10	6	8	10	10	10	9	9	9	8	3	9	8	9	10	0	10	5	10	9	9	10
Velvetleaf	9	8	7	0	10	8	3	10	1	5	-	10	9	2	9	10	4	4	8	5	10	7	0	10	0	10	0	8	10
Wheat	2	1	1	0	2	2	0	1	0	2	1	2	1	1	0	1	1	0	1	1	1	2	0	3	1	2	0	3	1
Wild oats	9	9	8	0	10	7	2	5	5	8	5	9	9	5	8	8	6	0	6	4	10	8	0	8	4	4	9	5	10

Table B	COMPOUND					
Rate 62 g/ha	51	52	53	54	56	57
Preemergence						
B. signalgrass	-	-	-	-	6	3
Blackgrass	1	1	0	1	2	1
Cocklebur	1	1	0	0	0	0
Corn	0	3	0	0	2	0
Crabgrass	6	9	0	4	9	8
Galium	4	5	3	4	8	6
Giant foxtail	7	10	0	1	10	9
Morningglory	4	3	0	3	9	3
Nutsedge	0	0	0	0	0	0
Rape	7	6	0	0	10	8
Redroot pigweed	7	9	2	1	10	8
Soybean	0	0	0	0	0	0
Sugarbeets	9	10	2	9	10	7
Velvetleaf	5	5	0	2	9	2
Wheat	0	1	0	0	1	0
Wild oats	0	4	0	1	10	4

Table B	COMPOUND																														
Rate 31 g/ha	12	13	14	16	17	19	22	23	24	25	27	28	34	35	36	37	38	39	40	41	44	45	46	49	51	52	53	54	56		
Postemergence																															
B. signalgrass	-	2	2	2	1	1	-	2	3	3	2	4	2	2	4	4	1	2	3	1	3	3	5	3	-	-	-	-	2		
Barnyardgrass	4	3	3	4	2	2	3	2	2	4	1	3	3	3	5	4	0	4	1	2	3	2	3	4	0	3	0	1	6		
Blackgrass	2	3	2	3	2	1	3	2	2	4	3	3	2	1	4	3	0	2	4	1	3	2	2	4	2	4	0	2	2		
Cocklebur	8	8	7	5	7	6	3	6	6	9	7	6	7	9	8	8	2	8	8	-	8	4	8	9	4	5	3	6	5		
Corn	1	2	2	2	1	1	1	1	2	3	1	2	2	1	3	3	1	1	3	0	3	3	2	2	2	2	0	1	2		
Crabgrass	6	5	4	8	3	2	3	2	7	3	2	3	3	3	7	5	0	3	3	3	2	2	2	8	2	3	0	1	3		
Ducksalad	2	0	0	7	2	0	0	1	1	4	2	1	0	1	3	2	0	2	1	1	3	2	0	3	0	0	0	0	7		
Galium	8	8	8	-	-	7	5	9	7	9	8	8	9	-	8	8	0	10	-	7	7	4	7	9	8	8	2	8	9		
Giant foxtail	2	5	2	8	4	2	2	3	6	3	2	3	4	2	6	3	1	5	4	2	3	2	2	5	0	3	0	1	7		
Morningglory	10	-	10	4	8	2	8	3	-	9	2	-	-	7	8	7	1	7	8	2	8	7	3	6	3	6	1	6	8		
Nutsedge	1	0	0	0	0	0	0	0	0	-	0	0	-	0	-	0	0	0	0	0	0	0	0	2	0	0	0	0	0		
Rape	9	8	8	9	7	6	9	7	-	8	9	9	9	9	8	9	2	10	10	1	7	7	8	8	7	7	0	2	9		
Redroot pigweed	9	9	8	9	9	8	8	9	10	9	9	9	9	9	6	8	2	9	9	6	8	9	9	9	9	8	4	6	8		
Rice	4	2	3	5	2	1	0	1	4	2	0	3	1	0	4	4	0	4	2	1	3	0	2	3	0	1	0	0	6		
S. Flatsedge	8	5	1	9	8	7	1	6	7	6	2	8	1	3	9	6	2	8	4	7	8	8	2	7	0	5	2	1	9		
Soybean	5	6	7	6	6	4	6	3	4	7	6	8	7	7	7	9	1	7	6	0	5	8	6	8	4	5	0	3	5		
Sugarbeets	7	9	7	8	9	8	9	9	10	8	9	9	9	9	9	8	3	9	9	6	9	9	9	9	7	9	5	8	9		
Velvetleaf	8	9	7	7	6	3	8	6	8	8	7	8	8	9	7	7	1	6	7	0	6	6	7	8	3	4	0	6	6		
Wheat	1	1	1	1	1	1	1	1	1	3	1	2	1	1	3	3	0	2	3	1	2	0	3	2	1	2	0	0	0		
Wild oats	2	2	3	2	2	1	3	2	2	4	2	3	1	1	4	4	0	2	3	1	1	2	2	4	1	3	0	0	2		

Table B COMPOUND	
Rate 31 g/ha	57
Postemergence	
B. signalgrass	1
Barnyardgrass	1
Blackgrass	1
Cocklebur	6
Corn	1
Crabgrass	2
Ducksalad	2
Galium	8
Giant foxtail	3
Morningglory	9
Nutsedge	0
Rape	8
Redroot pigweed	9
Rice	3
S. Flatsedge	6
Soybean	2
Sugarbeets	8
Velvetleaf	6
Wheat	1
Wild oats	1

Table B	COMPOUND																													
Rate 31 g/ha	12	13	14	16	17	19	22	23	24	25	27	28	34	35	36	37	38	39	40	41	44	45	46	49	51	52	53	54	56
Preemergence																													
B. signalgrass	-	9	-	8	4	2	-	3	9	8	5	9	3	2	-	-	0	6	8	3	4	5	4	9	-	-	-	-	4
Blackgrass	3	6	3	3	2	2	1	2	4	4	1	5	2	2	5	8	0	3	4	3	2	3	1	9	0	1	0	0	2
Cocklebur	1	1	1	1	1	0	0	2	0	6	0	-	0	1	1	1	0	1	-	0	0	-	1	1	0	0	0	0	0
Corn	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	3	0	0	1
Crabgrass	9	9	7	10	9	6	6	8	9	5	3	7	7	8	10	9	1	9	9	3	5	0	1	10	2	8	0	1	9
Galium	6	6	3	7	6	2	3	8	6	8	-	1	2	3	7	8	0	3	6	1	2	0	2	9	-	3	0	1	7
Giant foxtail	9	9	9	10	9	5	8	8	9	8	5	8	8	6	10	10	1	10	9	6	8	2	5	10	1	10	0	0	10
Morningglory	7	9	4	10	3	8	2	4	10	6	2	8	2	2	3	7	0	2	7	2	2	1	1	7	4	2	0	3	3
Nutsedge	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0
Rape	6	9	5	10	10	4	3	9	10	5	2	7	4	3	8	4	0	3	8	0	2	0	3	9	4	5	0	0	9
Redroot pigweed	10	10	8	10	3	9	5	8	9	6	3	8	3	7	8	10	0	4	8	2	8	5	8	10	7	6	0	1	10
Soybean	1	1	0	1	1	0	1	1	2	1	0	1	0	1	0	1	0	2	0	0	0	0	0	1	0	0	0	0	0
Sugarbeets	10	10	6	10	9	10	7	10	10	9	9	9	9	3	9	9	0	8	9	1	9	2	8	10	6	9	0	9	10
Velvetleaf	8	8	5	8	7	2	4	6	10	7	2	2	6	5	7	5	0	3	7	0	3	0	2	10	1	2	0	0	5
Wheat	1	1	1	1	1	0	1	1	1	0	0	0	0	0	1	1	0	0	1	0	0	0	1	1	0	0	0	0	0
Wild oats	8	7	8	9	6	0	6	4	7	7	3	7	3	2	8	4	0	3	6	2	0	6	3	10	0	3	0	0	9

Table B COMPOUND	
Rate 31 g/ha	57
Preemergence	
B. signalgrass	2
Blackgrass	1
Cocklebur	0
Corn	0
Crabgrass	3
Galium	2
Giant foxtail	8
Morningglory	2
Nutsedge	0
Rape	7
Redroot pigweed	5
Soybean	0
Sugarbeets	4
Velvetleaf	2
Wheat	0
Wild oats	3

Table B COMPOUND	
Rate 16 g/ha	44
Postemergence	
B. signalgrass	3
Barnyardgrass	-
Blackgrass	2
Cocklebur	8
Corn	3
Crabgrass	2
Ducksalad	-
Galium	7
Giant foxtail	2
Morningglory	8
Nutsedge	0
Rape	7
Redroot pigweed	8
Rice	-
S. Flatsedge	-
Soybean	3
Sugarbeets	9
Velvetleaf	6
Wheat	1
Wild oats	1

Table B COMPOUND	
Rate 16 g/ha	44
Preemergence	
B. signalgrass	2
Blackgrass	1
Cocklebur	0
Corn	0
Crabgrass	3
Galium	1
Giant foxtail	3
Morningglory	1
Nutsedge	0
Rape	0
Redroot pigweed	7
Soybean	0
Sugarbeets	7
Velvetleaf	0
Wheat	0
Wild oats	0

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TEST C

The compounds evaluated in this test were formulated in a non-phytoxic solvent mixture which included a surfactant and applied to the soil surface before plant seedlings emerged (preemergence application), to water that covered the soil surface (flood application), and to plants that were in the one-to-four leaf stage (postemergence application). A sandy loam soil was used for the preemergence and postemergence tests, while a silt loam soil was used in the flood application. Water depth was approximately 2.5 cm for the flood application and was maintained at this level for the duration of the test.

Plant species in the preemergence and postemergence tests consisted of barnyardgrass (*Echinochloa crus-galli*), winter barley (*Hordeum vulgare*), bedstraw (*Galium aparine*), blackgrass (*Alopecurus myosuroides*), chickweed (*Stellaria media*), cocklebur (*Xanthium strumarium*), corn 1 (*Zea mays*), cotton (*Gossypium hirsutum*), crabgrass (*Digitaria sanguinalis*), downy brome (*Bromus tectorum*), giant foxtail (*Setaria faberii*), johnsongrass (*Sorghum halpense*), lambsquarters (*Chenopodium album*), morningglory (*Ipomoea hederacea*), pigweed (*Amaranthus retroflexus*), rape (*Brassica napus*), Italian ryegrass (*Lolium multiflorum*), soybean (*Glycine max*), speedwell (*Veronica persica*), sugar beet (*Beta vulgaris*), velvetleaf (*Abutilon theophrasti*), wheat (*Triticum aestivum*), wild buckwheat (*Polygonum convolvulus*), and wild oat (*Avena fatua*). All plant species were planted one day before application of the compound for the preemergence portion of this test. Plantings of these species were adjusted to produce plants of appropriate size for the postemergence portion of the test. Plant species in the flood test consisted of rice (*Oryza sativa*), umbrella sedge (*Cyperus difformis*), duck salad (*Heteranthera limosa*) and barnyardgrass 1 (*Echinochloa crus-galli*) to the 2 leaf stage for testing.

All plant species were grown using normal greenhouse practices. Visual evaluations of injury expressed on treated plants, when compared to untreated controls, were recorded approximately fourteen to twenty one days after application of the test compound. Plant response to the test compound is summarized in Table C, recorded on a 0 to 100 scale where 0 is no effect and 100 is complete control. A dash (-) response means no test result.

Table C	COMPOUND
Rate 500 g/ha	6
POSTEMERGENCE	
Barley (winter)	40
Barnyardgrass	60
Barnyardgrass 1	80
Bedstraw	95
Blackgrass	40
Chickweed	90

Table C	COMPOUND
Rate 500 g/ha	6
PREEMERGENCE	
Barley (winter)	10
Barnyardgrass	85
Bedstraw	80
Blackgrass	100
Chickweed	95
Cocklebur	0

Table C	COMPOUND
Rate 250 g/ha	6
POSTEMERGENCE	
Barley (winter)	30
Barnyardgrass	40
Barnyardgrass 1	50
Bedstraw	90
Blackgrass	35
Chickweed	90

Cocklebur	80
Corn 1	30
Cotton	100
Crabgrass	80
Downy brome	30
Ducksalad	50
Giant foxtail	50
Italn. ryegrass	35
Johnsongrass	70
Lambsquarter	100
Morningglory	90
Rape	100
Redroot pigweed	90
Rice japonica	20
Soybean	80
Speedwell	100
Sugar beet	90
Umbrella sedge	80
Velvetleaf	70
Wheat	25
Wild buckwheat	95
Wild oat	60

Corn 1	0
Cotton	0
Crabgrass	100
Downy brome	70
Giant foxtail	100
Italn. ryegrass	50
Johnsongrass	100
Lambsquarter	90
Morningglory	100
Rape	100
Redroot pigweed	100
Soybean	0
Speedwell	100
Sugar beet	100
Velvetleaf	40
Wheat	0
Wild buckwheat	70
Wild oat	95

Cocklebur	70
Corn 1	30
Cotton	70
Crabgrass	70
Downy brome	20
Ducksalad	30
Giant foxtail	30
Italn. ryegrass	25
Johnsongrass	50
Lambsquarter	90
Morningglory	90
Rape	100
Redroot pigweed	90
Rice japonica	10
Soybean	70
Speedwell	100
Sugar beet	90
Umbrella sedge	80
Velvetleaf	50
Wheat	25
Wild buckwheat	90
Wild oat	50

Table C COMPOUND	
Rate 250 g/ha	6
PREEMERGENCE	
Barley (winter)	0
Barnyardgrass	35
Bedstraw	70
Blackgrass	80
Chickweed	95
Cocklebur	0
Corn 1	0
Cotton	0
Crabgrass	100
Downy brome	20
Giant foxtail	100
Italn. ry grass	30

Table C COMPOUND	
Rate 125 g/ha	6
POSTEMERGENCE	
Barley (winter)	25
Barnyardgrass	20
Barnyardgrass 1	30
Bedstraw	90
Blackgrass	30
Chickweed	90
Cocklebur	70
Corn 1	25
Cotton	70
Crabgrass	60
Downy brom	10
Ducksalad	20

Table C COMPOUND	
Rate 125 g/ha	6
PREEMERGENCE	
Barley (winter)	0
Barnyardgrass	20
Bedstraw	30
Blackgrass	70
Chickweed	70
Cocklebur	0
Corn 1	0
Cotton	0
Crabgrass	90
Downy brome	10
Giant foxtail	95
Italn. ry grass	20

Johnsongrass	80
Lambsquarter	90
Morningglory	70
Rape	80
Redroot pigweed	100
Soybean	0
Speedwell	100
Sugar beet	100
Velvetleaf	20
Wheat	0
Wild buckwheat	70
Wild oat	80

Giant foxtail	30
Italn. ryegrass	20
Johnsongrass	40
Lambsquarter	90
Morningglory	80
Rape	100
Redroot pigweed	90
Rice japonica	0
Soybean	60
Speedwell	100
Sugar beet	90
Umbrella sedge	70
Velvetleaf	40
Wheat	15
Wild buckwheat	80
Wild oat	40

Johnsongrass	80
Lambsquarter	70
Morningglory	35
Rape	40
Redroot pigweed	100
Soybean	0
Speedwell	90
Sugar beet	80
Velvetleaf	10
Wheat	0
Wild buckwheat	40
Wild oat	50

Table C COMPOUND	
Rate 62 g/ha	6
POSTEMERGENCE	
Barley (winter)	25
Barnyardgrass	15
Barnyardgrass 1	20
Bedstraw	70
Blackgrass	20
Chickweed	70
Cocklebur	60
Corn 1	25
Cotton	30
Crabgrass	40
Downy brome	0
Ducksalad	0
Giant foxtail	20
Italn. ryegrass	15
Johnsongrass	40
Lambsquarter	90
Morningglory	80
Rape	90

Table C COMPOUND	
Rate 62 g/ha	6
PREEMERGENCE	
Barley (winter)	0
Barnyardgrass	0
Bedstraw	20
Blackgrass	35
Chickweed	50
Cocklebur	0
Corn 1	0
Cotton	0
Crabgrass	35
Downy brome	0
Giant foxtail	90
Italn. ryegrass	10
Johnsongrass	20
Lambsquarter	40
Morningglory	0
Rape	0
Redroot pigweed	100
Soybean	0

Redroot pigweed	90	Speedwell	80
Rice japonica	0	Sugar beet	80
Soybean	50	Velvetleaf	10
Speedwell	100	Wheat	0
Sugar beet	90	Wild buckwheat	20
Umbrella sedge	50	Wild oat	10
Velvetleaf	30		
Wheat	10		
Wild buckwheat	80		
Wild oat	40		

TEST D

Compounds evaluated in this test were formulated in a non-phytotoxic solvent mixture which included a surfactant and applied to plants that were grown for various periods of time before treatment (postemergence application). A mixture of sandy loam soil and greenhouse potting mix in a 60:40 ratio was used for the postemergence test.

Plantings of these crops and weed species were adjusted to produce plants of appropriate size for the postemergence test. All plant species were grown using normal greenhouse practices. Crop and weed species include arrowleaf sida (*Sida rhombifolia*), barnyardgrass (*Echinochloa crus-galli*), cocklebur (*Xanthium strumarium*), common ragweed (*Ambrosia elatior*), corn 1 (*Zea mays*), cotton (*Gossypium hirsutum*), eastern black nightshade (*Solanum ptycanthum*), fall panicum (*Panicum dichotomiflorum*), field bindweed (*Convolvulus arvensis*), giant foxtail (*Setaria faberii*), hairy beggarticks (*Bidens pilosa*), ivyleaf morningglory (*Ipomoea hederacea*), johnsongrass (*Sorghum halepense*), ladysthumb smartweed (*Polygonum persicaria*), lambsquarters (*Chenopodium album*), large crabgrass (*Digitaria sanguinalis*), purple nutsedge (*Cyperus rotundus*), redroot pigweed (*Amaranthus retroflexus*), soybean 1(*Glycine max*), surinam grass (*Brachiaria decumbens*), velvetleaf (*Abutilon theophrasti*) and wild poinsettia (*Euphorbia heterophylla*).

Treated plants and untreated controls were maintained in a greenhouse for approximately 14 to 21 days, after which all treated plants were compared to untreated controls and visually evaluated. Plant response ratings, summarized in Table D, were based upon a 0 to 100 scale where 0 was no effect and 100 was complete control. A dash response (-) means no test result.

Table D	COMPOUND										
Rate 280 g/ha	12	13	14	20	22	25	34	35	49	56	57
PREEMERGENCE											
Arrowleaf sida	100	100	100	100	100	100	95	100	100	100	95
Barnyardgrass	100	60	10	80	5	30	100	90	100	40	20
Cocklebur	20	80	30	50	0	50	35	70	40	25	10
Common ragweed	100	100	100	100	80	100	100	100	100	100	-
Corn 1	5	5	5	5	0	10	15	10	5	50	10
Cotton	100	100	80	30	20	30	75	80	60	50	65
E. blacknightsh	100	100	100	100	100	100	95	100	100	100	100
Fall panicum	100	100	100	100	100	100	100	100	100	100	85
Field bindweed	100	100	100	100	80	100	100	100	100	100	100
Giant foxtail	100	100	100	100	100	100	100	100	100	70	100
H. beggarticks	100	100	100	100	70	10	100	95	90	95	65
I. morningglory	100	100	80	100	5	100	60	100	100	100	80
Johnsongrass	100	50	50	70	50	20	65	75	100	25	15
Ladysthumb	100	-	100	-	-	100	100	100	-	100	100
Lambsquarters	100	100	100	100	100	100	100	100	100	100	100
Large crabgrass	100	100	100	100	100	100	100	100	100	100	100
Purple nutsedge	0	10	0	5	0	0	0	0	5	20	0
Redroot pigweed	100	100	100	100	100	100	100	100	100	100	100
Soybean 1	60	50	15	25	20	10	30	20	30	30	0
Surinam grass	100	85	70	100	55	95	90	85	100	60	40
Velvetleaf	100	90	90	100	70	100	100	100	100	100	100
Wild poinsettia	100	100	80	90	50	50	75	100	90	100	75

Table D	COMPOUND																
Rate 140 g/ha	12	13	14	16	17	20	22	25	29	34	35	36	37	40	49	56	57
PREEMERGENCE																	
Arrowleaf sida	100	100	100	100	90	100	100	95	90	95	95	95	95	90	100	100	100
Barnyardgrass	100	40	5	20	20	10	5	10	35	40	25	20	40	70	70	40	20
Cocklebur	5	5	5	10	-	50	0	10	-	20	10	0	20	-	40	10	10
Common ragweed	85	100	100	20	25	100	55	95	-	100	60	95	90	100	100	100	-
Corn 1	5	5	5	35	20	5	0	10	10	10	10	20	10	0	5	35	10
Cotton	75	80	40	15	15	95	-	20	70	50	40	60	100	0	55	20	40
E. blacknightsh	100	100	100	95	100	100	70	80	95	90	95	100	100	90	100	100	100
Fall panicum	100	100	100	100	70	100	90	95	95	100	95	100	100	100	100	90	70
Field bindweed	100	100	100	90	95	100	-	100	100	100	100	100	100	95	100	100	75
Giant foxtail	100	100	100	50	100	100	90	85	100	100	60	100	100	25	100	100	95
H. beggarticks	80	100	85	10	90	100	-	10	35	95	95	95	95	20	50	10	65
I. morningglory	100	100	80	60	25	100	5	50	-	60	30	40	75	20	100	85	75
Johnsongrass	100	50	10	20	50	30	20	10	85	40	25	20	40	50	55	10	10
Ladysthumb	100	-	100	-	-	100	-	100	100	95	100	100	100	-	-	80	100
Lambsquarters	100	100	100	95	95	100	80	100	100	100	100	100	100	100	100	100	100
Large crabgrass	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	50	95
Purple nutsedge	0	0	0	-	0	5	0	0	-	0	0	0	0	0	0	0	0
Redroot pigweed	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Soybean 1	50	20	5	0	0	15	5	10	10	15	15	50	15	0	30	15	0
Surinam grass	100	80	70	30	75	70	20	70	95	80	35	80	100	25	100	50	40

Velvetleaf	100	90	90	50	90	70	50	80	95	100	100	100	100	85	100	100	100
Wild poinsettia	50	80	10	100	60	60	30	40	65	75	90	100	70	60	80	100	40

Table D	COMPOUND																
Rate 70 g/ha	12	13	14	16	17	20	22	25	29	34	35	36	37	40	49	56	57
PREEMERGENCE																	
Arrowleaf sida	100	100	100	90	85	100	95	100	75	90	80	90	95	90	100	100	95
Barnyardgrass	5	5	5	10	10	5	0	10	10	20	20	20	20	25	10	20	10
Cocklebur	0	5	0	10	10	5	0	0	0	10	0	-	20	0	0	0	0
Common ragweed	85	100	95	10	10	80	5	70	-	60	50	100	100	95	60	20	-
Corn 1	0	5	0	10	0	5	0	5	10	10	10	15	0	0	5	25	5
Cotton	5	5	40	10	-	5	0	20	40	25	-	40	20	0	55	10	15
E. blacknightsh	100	100	100	95	100	100	50	50	85	90	60	100	100	80	100	100	80
Fall panicum	100	100	100	95	60	100	5	80	30	100	100	100	100	100	100	70	25
Fi ld bindweed	100	100	100	80	60	100	10	70	70	80	100	100	90	60	100	95	75
Giant foxtail	100	100	100	50	95	100	45	20	95	80	10	100	10	20	100	80	80
H. beggarticks	80	100	80	10	80	100	50	10	35	70	95	50	85	20	45	-	20
I. morningglory	80	5	10	50	10	80	5	25	50	35	30	25	50	20	30	40	50
Johnsongrass	50	30	10	20	25	10	5	10	20	15	10	20	25	20	50	0	10
Ladysthumb	100	-	100	-	-	60	40	50	100	70	100	100	70	-	-	80	50
Lambsquarters	100	100	100	80	90	100	80	95	-	100	100	100	100	100	100	100	80
Large crabgrass	100	100	100	75	100	100	40	60	100	100	-	75	100	80	100	40	75
Purple nutsedge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Redroot pigweed	100	100	100	100	100	100	100	100	100	95	100	100	100	100	100	100	100
Soybean 1	5	5	5	0	0	5	0	0	5	10	5	20	10	0	5	0	0
Surinam grass	50	30	10	20	25	40	20	40	70	40	20	50	70	20	80	20	30
V lvetleaf	90	80	80	40	70	70	5	80	65	90	90	100	100	65	100	100	75
Wild poinsettia	20	60	10	40	10	50	5	25	20	40	100	90	50	10	50	20	10

Table D	COMPOUND																
Rate 35 g/ha	12	13	14	16	17	20	22	25	29	34	35	36	37	40	49	56	57
PREEMERGENCE																	
Arrowleaf sida	100	90	100	90	100	95	50	90	50	90	75	90	85	90	90	100	70
Barnyardgrass	0	0	0	10	10	5	0	10	10	10	10	10	10	20	5	10	0
Cocklebur	0	0	0	-	-	0	0	-	0	0	0	-	10	0	0	0	-
Common ragweed	50	70	40	10	10	30	5	10	-	20	10	100	50	10	50	0	-
Corn 1	0	0	0	0	0	5	0	0	10	5	5	15	0	0	0	0	5
Cotton	5	5	10	5	0	60	0	10	20	15	10	15	10	0	10	10	-
E. blacknightsh	100	95	100	95	80	100	40	35	70	40	50	95	-	80	100	90	80
Fall panicum	100	40	50	50	25	10	-	35	20	70	90	90	80	65	80	20	0
Field bindweed	70	100	90	60	25	100	10	65	50	100	95	100	100	20	100	85	65
Giant foxtail	100	100	80	25	20	70	5	10	85	20	10	40	10	0	100	10	50
H. beggarticks	30	70	30	10	50	100	50	0	20	20	90	20	10	10	40	0	20
I. morningglory	10	5	5	50	10	60	0	20	10	20	30	20	20	10	10	20	20
Johnsongrass	5	10	0	10	10	10	0	10	10	10	10	10	10	20	5	0	5
Ladysthumb	100	-	100	-	-	60	-	40	65	60	100	90	-	-	-	20	-

Lambsquarters	100	100	100	20	80	100	60	85	95	95	95	100	100	20	100	100	20
Large crabgrass	100	100	100	50	75	100	40	50	85	100	100	50	25	50	80	30	25
Purple nutsedge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Redroot pigweed	100	100	100	50	100	100	50	80	100	90	50	90	100	80	100	95	95
Soybean 1	5	0	5	0	0	5	0	-	0	5	0	10	5	0	5	0	0
Surinam grass	45	10	5	10	10	5	5	20	65	20	10	30	20	10	10	20	15
Velvetleaf	75	50	20	10	40	50	0	50	50	90	80	75	60	20	60	100	40
Wild poinsettia	15	30	5	10	-	30	0	10	10	20	25	70	40	10	10	10	10

Table D	COMPOUND							
Rate 17 g/ha	12	16	17	20	29	36	37	40
PREEMERGENCE								
Arrowleaf sida	90	80	90	25	25	80	80	70
Barnyardgrass	0	10	0	10	5	10	5	10
Cocklebur	0	-	0	0	0	0	0	0
Common ragweed	10	10	0	25	-	30	10	10
Corn 1	5	0	0	0	5	10	0	0
Cotton	10	0	0	10	20	5	10	0
E. blacknightsh	25	100	25	80	70	50	75	80
Fall panicum	20	25	10	20	10	70	50	50
Field bindweed	65	35	20	50	20	80	70	20
Giant foxtail	20	20	20	10	30	10	10	0
H. beggarticks	0	0	10	10	10	0	10	0
I. morningglory	10	40	10	20	10	10	10	10
Johnsongrass	10	10	0	10	5	5	10	0
Ladysthumb	80	-	-	15	10	10	50	-
Lambsquarters	100	-	10	70	20	50	95	10
Large crabgrass	40	50	20	40	60	30	25	25
Purple nutsedge	0	0	0	0	0	0	0	0
Redroot pigweed	100	-	65	65	95	90	65	70
Soybean 1	5	0	0	0	0	0	5	0
Surinam grass	20	10	10	10	25	10	10	10
Velvetleaf	30	0	10	50	-	50	50	10
Wild poinsettia	10	0	0	10	0	20	10	0

TEST E

Compounds evaluated in this test were formulated in a non-phytotoxic solvent mixture which included a surfactant and applied to the soil surface before plant seedlings emerged (preemergence application) and to plants that were grown for various periods of time before treatment (postemergence application). A sandy loam soil was used for the preemergence test while a mixture of sandy loam soil and greenhouse potting mix in a 60:40 ratio was used for the postemergence test. Test compounds were applied within approximately one day after planting seeds for the preemergence test, and 13 days after the last postemergence planting.

Plantings of these crops and weed species were adjusted to produce plants of appropriate size for the postemergence test. All plant species were grown using normal greenhouse practices. Crop and weed species include alexandergrass (*Brachiaria*

plantaginea), black nightshade (*Solanum americanum*), apple-of-Peru (*Nicandra physaloides*), arrowleaf sida (*Sida rhombifolia*), Brazilian sicklepod (*Cassia tora* Brazilian), Brazilian signalgrass (*Brachiaria decumbens*), bristly starbur (*Acanthospermum hispidum*), capim-colchao (*Digitaria horizontalis*), corn (*Zea mays*), soybean 1 (*Glycine max* cv. Cristalina), hairy beggarticks (*Bidens pilosa*), slender amaranth (*Amaranthus viridis*), southern sandur (*Cenchrus echinatus*), tall morningglory (*Ipomoea purpurea*), tropical spiderwort (*Commelina benghalensis*), Soybean 2 (*Glycine max* cv. W20), Soybean 3 (*Glycine max* cv. W4-4) and wild pointsettia (*Eupohorbia heterophylla*).

Treated plants and untreated controls were maintained in a greenhouse for approximately 13 days, after which all treated plants were compared to untreated controls and visually evaluated. Plant response ratings, summarized in Table E, are based upon a 0 to 100 scale where 0 is no effect and 100 is complete control. A dash response (-) means no test result.

Table E	COMPOUND					
Rate 140 g/ha	12	13	14	20	22	49
PREEMERGENCE						
Alexandergrass	80	70	60	85	60	10
Apple-of-Peru	100	100	90	100	90	5
Arrowleaf sida	100	100	100	100	90	80
B. Signalgrass	100	70	50	70	80	10
Blk nightshade	100	100	100	100	100	90
Braz sicklepod	50	80	70	90	60	0
Bristly starbur	100	60	90	100	100	0
Capim-Colch	100	100	90	100	60	70
Corn	10	5	5	5	5	20
H. beggarticks	0	100	90	100	100	0
Morningglory	80	70	70	40	60	40
S. amaranth	100	100	100	100	100	100
S. sandbur	80	75	50	50	60	5
Soybean 1	70	40	35	25	60	5
Soybean 2	50	10	10	60	45	5
Soybean 3	80	20	10	10	70	10
Tr. Spiderwort	100	100	85	95	90	0
Wild poinsettia	100	90	50	60	70	100

Table E	COMPOUND					
Rate 70 g/ha	12	13	14	20	22	49
PREEMERGENCE						
Alexandergrass	60	40	30	10	60	0
Apple-of-Peru	100	90	70	100	80	0
Arrowleaf sida	100	100	90	100	-	80
B. Signalgrass	60	40	20	50	40	0
Blk nightshade	100	100	100	100	90	80
Braz sicklepod	40	10	5	40	-	0
Bristly starbur	5	-	40	100	40	0
Capim-Colch	90	90	90	100	60	70
Corn	5	5	0	0	0	5
H. beggarticks	0	100	10	90	100	0
Morningglory	40	50	10	40	50	5
S. amaranth	100	100	100	100	100	100
S. sandbur	75	40	5	30	-	0
Soybean 1	35	30	15	25	50	0
Soybean 2	40	5	10	15	5	5
Soybean 3	50	15	5	10	10	0
Tr. Spiderwort	80	100	60	95	90	0
Wild poinsettia	100	50	10	30	-	5

Table E	COMPOUND					
Rate 35 g/ha	12	13	14	20	22	49
PREEMERGENCE						
Alexandergrass	60	30	20	10	0	0
Apple-of-Peru	10	80	5	90	80	0
Arrowleaf sida	90	80	85	90	80	0
B. Signalgrass	30	5	5	5	10	0
Blk nightshade	100	100	90	90	90	50
Braz sicklepod	0	0	0	5	20	0
Bristly starbur	5	0	0	90	-	-
Capim-Colch	90	80	50	90	10	60
Corn	0	0	0	0	0	0
H. beggarticks	0	50	0	100	0	0
Morningglory	5	50	5	10	50	0
S. amaranth	100	100	90	100	85	80
S. sandbur	20	5	0	10	0	0

Soybean 1	10	10	5	10	10	0
Soybean 2	5	5	5	15	5	0
Soybean 3	10	10	5	5	5	0
Tr. Spiderwort	20	10	0	20	40	0
Wild poinsettia	5	5	-	30	40	0

Table E	COMPOUND					
Rate 17 g/ha	12	13	14	20	22	49
PREEMERGENCE						
Alexandergrass	5	0	0	0	0	0
Apple-of-Peru	-	0	0	85	80	0
Arrowleaf sida	85	70	80	70	50	0
B. Signalgrass	5	0	0	0	-	0
Blk nightshade	85	85	80	90	80	10
Braz sicklepod	-	0	0	5	20	0
Bristly starbur	-	0	0	85	20	0
Capim-Colch	50	40	20	80	-	0
Corn	0	0	0	0	0	0
H. beggarticks	0	-	0	0	0	0
Morningglory	0	0	0	5	5	0
S. amaranth	100	60	90	60	80	70
S. sandbur	0	0	0	0	0	0
Soybean 1	5	5	0	10	10	0
Soybean 2	5	5	0	5	5	0
Soybean 3	0	10	0	5	5	0
Tr. Spiderwort	5	0	0	0	-	0
Wild poinsettia	5	5	5	10	40	0

TEST F

Seeds, tubers, or plant parts of alexandergrass (*Brachiaria plantaginea),* broadleaf signalgrass (*Brachiaria decumbens*), bermudagrass (*Cynodon dactylon*), common purslane (*Portulaca oleracea*), common ragweed (*Ambrosia elatior*), common groundsel (*Senecio vulgaris*), dallisgrass (*Paspalum dilatatum*), goosegrass (*Eleusine indica*), guineagrass (*Panicum maximum*), itchgrass (*Rottboellia exaltata*), johnson grass (*Sorghum halepense*), large crabgrass (*Digitaria sanguinalis*), pitted morningglory (*Ipomoea lacunosa*), peanuts (*Arachis hypogaea*), purple nutsedge (*Cyperus rotundus*), sandbur (*Cenchrus echinatus*), sourgrass (*Trichachne insularis*), Spanishneedles (*Bidens bipinnata*), sugarcane (*Saccharum officinarum*), surinam grass (*Brachiaria decumbens*) and tall mallow (*Malva sylvestris*)

were planted into greenhouse pots of flats containing greenhouse planting medium. Plant species were grown grown in separate pots or individual compartments. Preemergence applications were made within one day of planting the seed or plant part. Postemergence applications were applied when the plants were in the two to four leaf stage (three to twenty cm).

Test chemicals were formulated in a non-phytotoxic solvent mixture which included a surfactant and applied preemergence and postemergence to the plants. Untreated control plants and treated plants were placed in the greenhouse and visually evaluated for injury 13 to 21 days after herbicide application. Plant response ratings, summarized in Table F, are based on a 0 to 100 scale where 0 is no injury and 100 is complete control. A dash (-) response means no test result.

Table F	COMPOUND
Rate 1000 g/ha	13
POST DIRECTED	
Citrus	0

Table F	COMPOUND			
Rate 500 g/ha	12	13	19	20
POSTEMERGENCE				
Alexandergrass	100	-	100	90
B. signalgrass	-	-	-	-
Bermudagrass	50	-	10	40
C. purslane	75	-	75	70
C. ragweed	100	-	75	90
Com. groundsel	40	-	30	100
Dallisgrass	-	-	65	85
Goosegrass	90	-	75	90
Guineagrass	95	-	70	85
Itchgrass	90	-	65	75
Johnsongrass	90	-	75	90
Large crabgrass	80	-	70	85
P. morninglory	90	-	75	90
Peanuts	-	-	-	-
Purple nutsedge	0	-	0	5
Sandbur	-	-	10	70
Sourgrass	40	-	75	60

Table F	COMPOUND			
Rate 500 g/ha	12	13	19	20
PREEMERGENCE				
A. bluegrass	-	-	-	-
Alexandergrass	100	-	100	100
Arrowleaf sida	-	-	-	-
B. signalgrass	-	-	-	-
Barnyardgrass	-	-	-	-
Bermudagrass	100	-	100	100
C. purslane	100	-	100	100
C. ragweed	100	-	100	100
Com. chickweed	-	-	-	-
Com. groundsel	100	-	100	100
Cotton	-	-	-	-
Dallisgrass	100	-	100	100
Goosegrass	100	-	100	100
Green foxtail	-	-	-	-
Guineagrass	-	-	-	-
Itchgrass	98	-	90	100
Johnsongrass	100	-	70	100
Kochia	-	-	-	-
Large crabgrass	100	-	100	100
Leafy spurge	-	-	-	-
P. morninglory	100	-	80	100
P anuts	-	-	-	-
Purple nutsedge	10	-	0	0

Spanishneedles	20	-	30	50	Quackgrass	-	-	-	-
Sugarcane	-	20	-	-	Sandbur	100	-	50	100
Surinam grass	90	-	75	80	Sourgrass	100	-	100	100
Tall Mallow	100	-	95	100	Spanishneedles	100	-	100	100
					Sugarcane	-	100	-	-
					Surinam grass	100	-	98	100
					Tall Mallow	100	-	100	100

Table F	COMPOUND													
Rate 250 g/ha	12	13	16	17	19	20	23	25	35	36	37	49	50	56
POSTEMERGENCE														
Alexandergrass	90	75	85	40	30	50	25	80	30	95	90	10	20	80
B. signalgrass	-	80	-	-	-	-	-	-	-	-	-	-	-	-
Bermudagrass	40	10	20	10	10	40	10	30	30	40	40	0	20	10
C. purslane	75	100	30	20	75	70	25	75	70	65	70	10	25	75
C. ragweed	75	65	80	75	-	70	30	50	100	65	50	70	45	40
Com. groundsel	40	-	80	100	0	90	70	80	60	80	85	10	70	95
Dallisgrass	90	10	80	90	65	75	65	80	95	80	95	30	80	75
Goosegrass	90	20	80	90	-	90	10	90	95	90	90	10	30	80
Guineagrass	80	95	70	70	20	75	75	65	40	80	80	50	40	30
Itchgrass	90	40	85	80	20	65	10	40	75	65	60	60	85	40
Johnsongrass	85	40	85	30	75	75	10	35	65	40	75	20	65	20
Large crabgrass	80	95	85	85	35	75	60	80	75	90	85	40	20	70
P. morninglory	95	95	85	80	65	80	40	85	90	90	90	50	75	80
Peanuts	-	75	-	-	-	-	-	-	-	-	-	-	-	-
Purple nutsedge	0	20	40	10	0	5	5	5	0	10	5	0	20	40
Sandbur	60	20	0	40	5	30	10	20	20	20	65	0	0	0
Sourgrass	40	35	20	10	30	60	10	30	20	60	30	40	10	40
Spanishneedles	20	-	20	20	10	40	10	60	35	70	65	10	10	40
Sugarcane	-	25	-	-	-	-	-	-	-	-	-	-	-	-
Surinam grass	75	85	70	40	75	50	10	30	-	40	75	10	10	20
Tall Mallow	100	-	85	85	98	100	45	90	100	90	85	65	75	85

Table F	COMPOUND													
Rate 250 g/ha	12	13	16	17	19	20	23	25	35	36	37	49	50	56
PREEMERGENCE														
A. bluegrass	100	-	-	-	-	100	-	-	-	100	100	-	-	100
Alexandergrass	100	100	100	80	65	100	95	100	100	100	100	30	30	-

Arrowleaf sida	100	100	-	-	-	100	-	-	-	100	100	-	-	100
B. signalgrass	100	100	-	-	-	100	-	-	-	100	100	20	-	100
Barnyardgrass	100	98	-	-	-	100	-	-	-	100	100	-	-	90
Bermudagrass	100	100	100	100	100	100	100	100	100	100	100	98	100	-
C. purslane	100	100	100	100	100	100	100	100	100	100	100	100	100	100
C. ragweed	100	100	100	100	100	100	100	100	100	100	100	95	100	-
Com. chickweed	100	100	-	-	-	100	-	-	-	100	100	-	-	100
Com. groundsel	100	100	100	100	75	100	100	100	100	100	100	0	100	-
Cotton	-	90	-	-	-	-	-	-	-	-	-	0	-	-
Dallisgrass	100	100	100	100	95	100	100	100	100	100	100	70	95	-
Goosegrass	100	100	100	100	100	100	100	100	100	100	100	98	100	100
Green foxtail	100	100	-	-	-	100	-	-	-	100	100	-	-	100
Guineagrass	-	100	100	100	-	-	100	100	-	100	100	100	50	-
Itchgrass	100	60	90	60	80	100	75	75	95	85	95	30	65	-
Johnsongrass	100	70	80	100	50	98	65	15	100	100	100	20	60	-
Kochia	100	100	-	-	-	100	-	-	-	100	100	-	-	100
Large crabgrass	100	100	100	100	100	100	100	100	100	100	100	98	90	100
Leafy spurge	100	100	-	-	-	100	-	-	-	100	100	-	-	100
P. morninglory	100	95	100	90	80	100	90	100	100	98	98	10	100	100
Peanuts	-	10	-	-	-	-	-	-	-	-	-	0	-	-
Purple nutsedge	0	20	20	0	10	0	0	20	0	0	0	0	20	75
Quackgrass	100	98	-	-	-	100	-	-	-	100	100	-	-	100
Sandbur	100	80	100	50	30	100	65	50	90	100	100	0	20	80
Sourgrass	100	100	100	100	100	100	100	100	100	100	100	100	100	-
Spanishneedles	100	100	90	100	50	100	100	100	100	100	100	30	100	-
Sugarcane	-	15	-	-	-	-	-	-	-	-	-	-	-	-
Surinam grass	100	100	100	98	90	100	85	100	100	100	100	10	20	75
Tall Mallow	100	100	100	100	100	100	100	100	100	100	100	100	98	-

Table F	COMPOUND									
Rate 125 g/ha	12	13	19	20	25	35	36	37	49	56
POSTEMERGENCE										
Alexandergrass	80	20	30	20	20	30	30	50	40	30
B. signalgrass	-	50	-	-	-	-	-	-	20	-
Bermudagrass	30	10	10	30	10	30	20	20	10	10
C. purslan	65	90	75	70	60	70	65	60	100	60
C. ragweed	75	100	40	70	50	65	35	35	100	30
Com. groundsel	35	-	0	80	30	60	75	75	-	80

Dallisgrass	80	10	65	40	20	50	75	75	0	70
Goosegrass	90	0	-	75	90	65	60	85	30	70
Guineagrass	80	30	10	30	40	20	80	75	50	40
Itchgrass	60	20	20	65	10	75	35	35	20	10
Johnsongrass	75	35	40	75	10	65	35	40	35	10
Large crabgrass	80	60	35	75	80	30	30	75	65	70
P. morninglory	95	100	50	80	85	90	85	85	85	85
Peanuts	-	50	-	-	-	-	-	-	70	-
Purple nutsedge	0	10	0	0	0	0	0	5	0	0
Sandbur	40	0	0	20	20	10	5	40	0	0
Sourgrass	20	20	30	35	30	20	35	30	20	35
Spanishneedles	20	-	10	40	40	5	40	50	-	30
Sugarcane	-	20	-	-	-	-	-	-	-	-
Surinam grass	65	65	30	35	30	70	35	35	65	10
Tall Mallow	100	-	98	100	80	100	90	85	-	98

Table F	COMPOUND													
Rate 125 g/ha	12	13	16	17	19	20	23	25	35	36	37	49	50	56
PREEMERGENCE														
A. bluegrass	100	-	-	-	-	100	-	-	-	100	100	-	-	100
Alexandergrass	100	75	100	50	0	100	75	80	100	100	100	90	10	-
Arrowleaf sida	100	95	-	-	-	100	-	-	-	100	100	-	-	100
B. signalgrass	100	90	-	-	-	100	-	-	-	100	100	100	-	100
Barnyardgrass	90	80	-	-	-	95	-	-	-	100	100	-	-	80
Bermudagrass	100	100	100	100	98	100	100	100	100	100	100	100	100	-
C. purslane	100	100	100	100	100	100	100	100	100	100	100	100	100	100
C. ragweed	100	100	100	100	65	100	100	100	100	100	100	100	100	-
Com. chickweed	100	100	-	-	-	100	-	-	-	100	100	-	-	100
Com. groundsel	100	100	98	100	75	100	100	100	100	100	100	0	100	-
Cotton	-	40	-	-	-	-	-	-	-	-	-	40	-	-
Dallisgrass	100	100	100	100	80	100	100	100	100	100	100	100	70	-
Goosegrass	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Green foxtail	100	100	-	-	-	100	-	-	-	100	100	-	-	100
Guineagrass	-	100	100	98	-	-	100	100	-	100	100	100	20	-
Itchgrass	95	20	60	40	30	100	40	5	70	75	80	65	40	-
Johnsongrass	100	0	40	100	20	80	30	5	50	30	100	50	30	-
Kochia	100	100	-	-	-	100	-	-	-	100	100	-	-	100
Larg crabgrass	100	100	100	100	100	100	100	100	100	100	100	100	90	100

Leafy spurge	100	100	-	-	-	100	-	-	-	100	100	-	-	100
P. morninglory	100	75	100	90	80	100	98	100	100	100	98	80	80	100
Peanuts	-	10	-	-	-	-	-	-	-	-	-	0	-	-
Purple nutsedge	0	0	20	0	10	0	0	0	0	0	0	30	-	10
Quackgrass	100	95	-	-	-	100	-	-	-	100	100	-	-	100
Sandbur	100	10	100	10	10	100	40	10	75	90	60	40	0	60
Sourgrass	100	100	100	100	100	100	100	100	100	100	100	100	100	-
Spanishneedles	90	100	70	80	30	100	80	100	100	100	100	0	50	-
Sugarcane	-	15	-	-	-	-	-	-	-	-	-	-	-	-
Surinam grass	100	75	100	40	10	100	85	100	95	100	100	100	0	65
Tall Mallow	100	100	100	100	100	100	100	100	100	100	100	100	100	-

Table F	COMPOUND					
Rate 64 g/ha	12	13	19	20	35	49
POSTEMERGENCE						
Alexandergrass	90	20	20	-	10	10
B. signalgrass	-	20	-	-	-	10
Bermudagrass	20	10	10	20	20	10
C. purslane	65	90	50	70	70	100
C. ragweed	50	100	30	50	-	10
Com. groundsel	20	-	0	65	-	-
Dallisgrass	35	10	20	20	20	0
Goosegrass	80	0	75	75	65	30
Guineagrass	30	10	10	30	-	35
Itchgrass	40	10	10	20	75	20
Johnsongrass	40	5	20	65	35	35
Large crabgrass	50	30	10	50	20	20
P. morninglory	90	95	60	80	80	85
Peanuts	-	65	-	-	-	50
Purple nutsedge	0	10	0	0	0	0
Sandbur	0	0	0	10	0	0
Sourgrass	10	10	30	20	-	20
Spanishneedles	5	-	10	50	5	-
Sugarcane	-	20	-	-	-	-
Surinam grass	65	0	30	35	70	35
Tall Mallow	100	-	95	100	100	-

Table F	COMPOUND													
Rate 64 g/ha	12	13	16	17	19	20	23	25	35	36	37	49	50	56
PREEMERGENCE														
A. bluegrass	100	-	-	-	-	95	-	-	-	100	100	-	-	98
Alexandergrass	100	70	80	10	0	100	30	50	65	100	80	75	0	100
Arrowleaf sida	100	95	-	-	-	100	-	-	-	100	100	-	-	100
B. signalgrass	100	65	-	-	-	98	-	-	-	100	100	90	-	85
Barnyardgrass	35	65	-	-	-	25	-	-	-	80	98	-	-	40
Bermudagrass	100	98	100	100	90	100	100	100	100	100	100	100	95	100
C. purslane	100	100	100	100	100	100	100	100	100	100	100	100	100	100
C. ragweed	100	100	98	95	0	98	98	100	100	100	100	100	100	100
Com. chickweed	100	100	-	-	-	100	-	-	-	98	100	-	-	100
Com. groundsel	100	100	100	100	0	100	100	100	100	100	100	0	95	95
Cotton	-	40	-	-	-	-	-	-	-	-	-	15	-	-
Dallisgrass	100	90	100	60	20	100	80	-	100	100	100	98	50	100
Goosegrass	100	100	100	90	100	100	100	100	100	100	100	100	95	100
Green foxtail	100	100	-	-	-	100	-	-	-	100	100	-	-	100
Guineagrass	-	100	100	90	-	-	80	80	-	100	100	100	20	100
Itchgrass	100	35	35	10	-	75	20	5	5	10	80	50	20	10
Johnsongrass	40	20	10	100	0	40	30	5	20	5	10	35	10	5
Kochia	100	100	-	-	-	100	-	-	-	100	100	-	-	100
Large crabgrass	100	100	100	90	100	100	100	100	100	100	100	100	30	100
Leafy spurge	100	100	-	-	-	100	-	-	-	100	100	-	-	100
P. morninglory	95	60	100	80	35	100	60	90	100	95	100	70	80	100
Peanuts	-	5	-	-	-	-	-	-	-	-	-	0	-	-
Purple nutsedge	0	20	0	0	0	0	0	0	0	0	0	35	0	20
Quackgrass	98	50	-	-	-	100	-	-	-	100	100	-	-	90
Sandbur	35	20	50	10	0	75	20	5	20	30	60	35	0	10
Sourgrass	100	100	100	95	0	100	100	100	100	100	100	100	98	100
Spanishneedles	75	60	50	70	30	100	70	100	100	100	100	0	20	80
Sugarcane	-	10	-	-	-	-	-	-	-	-	-	-	-	-
Surinam grass	85	75	90	65	10	90	20	80	60	100	100	80	0	0
Tall Mallow	100	100	100	100	100	100	98	100	100	100	100	100	100	100

Table F	COMPOUND		
Rate 32 g/ha	12	19	20
POSTEMERGENCE			
Alexandergrass	40	0	20
B. signalgrass	-	-	-
Bermudagrass	10	0	20
C. purslane	65	50	70
C. ragweed	50	30	50
Com. groundsel	20	0	0
Dallisgrass	35	20	10
Goosegrass	75	70	75
Guineagrass	20	0	10
Itchgrass	20	5	20

Table F	COMPOUND		
Rate 32 g/ha	12	19	20
POSTEMERGENCE			
Johnsongrass	20	20	65
Large crabgrass	20	10	40
P. morninglory	65	60	80
Peanuts	-	-	-
Purple nutsedge	0	0	0
Sandbur	0	0	5
Sourgrass	10	20	20
Spanishneedles	5	10	35
Sugarcane	-	-	-
Surinam grass	65	30	20
Tall Mallow	90	75	80

Table F	COMPOUND												
Rate 32 g/ha	12	13	16	17	19	20	23	25	36	37	49	50	56
PREEMERGENCE													
A. bluegrass	98	-	-	-	-	100	-	-	100	80	-	-	80
Alexandergrass	75	10	30	0	0	50	10	35	75	-	0	0	35
Arrowleaf sida	100	90	-	-	-	100	-	-	100	100	-	-	100
B. signalgrass	85	0	-	-	-	80	-	-	100	100	0	-	75
Barnyardgrass	5	20	-	-	-	10	-	-	30	20	-	-	35
Bermudagrass	100	60	100	90	60	100	100	100	100	100	10	75	100
C. purslane	100	100	100	100	100	100	100	100	100	100	80	100	100
C. ragweed	100	60	90	90	0	98	98	90	75	100	90	98	90
Com. chickweed	95	65	-	-	-	100	-	-	100	98	-	-	100
Com. groundsel	98	100	75	100	0	100	100	100	100	100	0	75	50
Cotton	-	0	-	-	-	-	-	-	-	-	0	-	-
Dallisgrass	80	60	100	70	0	98	30	80	90	100	0	20	65
Goosegrass	100	98	100	80	0	100	100	100	100	100	80	50	100
Green foxtail	100	100	-	-	-	100	-	-	100	100	-	-	100
Guineagrass	-	80	90	60	-	-	70	70	75	100	20	-	85
Itchgrass	40	0	20	20	-	75	20	5	0	65	0	20	-
Johnsongrass	30	0	10	100	0	-	10	5	5	10	0	10	5
Kochia	100	98	-	-	-	100	-	-	100	100	-	-	100
Large crabgrass	100	30	100	80	0	100	35	80	100	100	0	20	85
Leafy spurge	100	75	-	-	-	100	-	-	100	100	-	-	100

P. morninglory	100	10	80	0	35	100	40	100	25	100	0	65	70
Peanuts	-	0	-	-	-	-	-	-	-	-	0	-	-
Purple nutsedge	0	0	0	0	0	0	0	0	0	0	0	0	0
Quackgrass	50	0	-	-	-	35	-	-	95	90	-	-	65
Sandbur	35	0	10	0	0	0	0	0	0	60	0	0	0
Sourgrass	98	98	100	90	0	100	90	100	100	100	40	98	100
Spanishneedles	60	0	50	70	20	100	70	40	100	100	0	0	5
Sugarcane	-	10	-	-	-	-	-	-	-	-	-	-	-
Surinam grass	75	10	35	20	10	50	10	40	10	100	0	0	0
Tall Mallow	100	98	100	100	100	100	98	100	98	100	98	98	100

Table F	COMPOUND											
Rate 16 g/ha	12	13	16	17	20	23	25	36	37	49	50	56
PREEMERGENCE												
A. bluegrass	35	-	-	-	50	-	-	80	80	-	-	20
Alexandergrass	-	0	0	0	-	0	10	-	-	0	0	0
Arrowleaf sida	95	75	-	-	100	-	-	98	98	-	-	95
B. signalgrass	20	0	-	-	20	-	-	90	90	0	-	5
Barnyardgrass	5	20	-	-	0	-	-	20	10	-	-	5
Bermudagrass	-	40	100	75	-	80	10	-	-	0	70	98
C. purslane	100	98	100	100	100	100	100	100	100	40	95	100
C. ragweed	-	-	65	-	-	90	0	-	-	25	0	95
Com. chickweed	95	20	-	-	80	-	-	98	80	-	-	80
Com. groundsel	-	100	50	95	-	100	95	-	-	0	20	0
Cotton	-	0	-	-	-	-	-	-	-	0	-	-
Dallisgrass	-	40	0	10	-	20	10	-	-	0	0	5
Goosegrass	100	60	100	5	100	40	75	100	100	0	10	80
Green foxtail	100	80	-	-	80	-	-	100	75	-	-	25
Guineagrass	-	60	90	40	-	30	0	-	-	0	0	100
Itchgrass	-	0	10	20	-	20	0	-	-	0	0	10
Johnsongrass	-	0	0	50	-	0	0	-	-	0	10	5
Kochia	90	98	-	-	98	-	-	100	100	-	-	100
Large crabgrass	90	30	70	5	75	5	35	100	50	0	0	35
Leafy spurge	80	75	-	-	90	-	-	90	100	-	-	100
P. morninglory	20	0	50	0	20	20	60	60	30	0	30	70
P anuts	-	-	-	-	-	-	-	-	-	0	-	-
Purple nutsedge	0	0	0	0	0	0	0	0	0	0	0	0
Quackgrass	10	0	-	-	10	-	-	80	50	-	-	0

Sandbur	0	0	0	0	0	0	0	5	20	0	0	0
Sourgrass	-	30	100	0	-	70	85	-	-	0	50	100
Spanishneedles	-	0	0	20	-	0	30	-	-	0	0	5
Sugarcane	-	-	-	-	-	-	-	-	-	-	-	-
Surinam grass	30	10	35	-	30	0	5	10	70	0	0	0
Tall Mallow	-	98	100	90	-	80	95	-	-	0	98	98

Table F	COMPOUND					Table F	COMPOUND				
Rate 8 g/ha	12	20	36	37	56	Rate 8 g/ha	12	20	36	37	56
PREEMERGENCE						PREEMERGENCE					
A. bluegrass	0	40	40	80	20	Itchgrass	-	-	-	-	0
Alexandergrass	-	-	-	-	0	Johnsongrass	-	-	-	-	0
Arrowleaf sida	0	85	95	90	95	Kochia	65	100	98	100	90
B. signalgrass	10	0	35	70	5	Large crabgrass	30	0	65	50	35
Barnyardgrass	0	0	20	10	0	Leafy spurge	65	75	70	80	80
Bermudagrass	-	-	-	-	25	P. morninglory	0	20	60	-	30
C. purslane	75	100	100	100	85	Peanuts	-	-	-	-	-
C. ragweed	-	-	-	-	75	Purple nutsedge	0	0	0	0	0
Com. chickweed	20	60	20	70	0	Quackgrass	10	0	55	10	0
Com. groundsel	-	-	-	-	-	Sandbur	0	0	0	0	0
Cotton	-	-	-	-	-	Sourgrass	-	-	-	-	50
Dallisgrass	-	-	-	-	0	Spanishneedles	-	-	-	-	0
Goosegrass	65	10	-	100	65	Sugarcane	-	-	-	-	-
Green foxtail	95	50	85	-	-	Surinam grass	0	0	10	65	0
Guineagrass	-	-	-	-	60	Tall Mallow	-	-	-	-	100

TEST G

Compounds evaluated in this test were formulated in a non-phytotoxic solvent mixture which included a surfactant and applied to plants that were in the 1- to 4-leaf stage (postemergence application). A mixture of sandy loam soil and greenhouse potting mix in a 60:40 ratio was used for the postemergence test.

Plantings of these crops and weed species were adjusted to produce plants of appropriate size for the postemergence test. All plant species were grown using normal greenhouse practices. Crop and weed species include alfalfa (*Medicago sativa*), annual bluegrass (*Poa annua*), blackgrass 2 (*Alopecurus myosuroides*), black nightshade (*Solanum nigra*), chickweed (*Stellaria media*), common poppy (*Papaver rhoeas*), deadnettle (*Lamium amplexicaule*), downy brome (*Bromus tectorum*), field violet (*Viola arvensis*), galium 2 (*Galium aparine*), green foxtail (*Setaria viridis*), ryegrass (*Lolium multiflorum*), jointed

goatgrass (*Aegilops cylindrica*), kochia (*Kochia scoparia*), lambsquarters (*Chenopodium album*), lentil (*Lens culinaris*), littleseed canarygrass (*Phalaris minor*), pea (*Pisum sativum*), potato (*Solanum tuberosum*), rape 1 (*Brassica napus*), redroot pigweed (*Amaranthus retroflexus*), Russian thistle (*Salsola kali*), scentless chamomile (*Matricaria inodora*), spring barley (*Hordeum vulgare*), sugar beet (*Beta vulgaris*), sunflower (*Helianthus annuus*), ivyleaf speedwell (*Veronica hederaefolia*), spring wheat (*Triticum aestivum*), winter wheat (*Triticum aestivum*), wild buckwheat (*Polygonum convolvulus*), wild mustard (*Sinapis arvensis*), wild oat 1 (*Avena fatua*), windgrass (*Apera spica-venti*) and winter barley (*Hordeum vulgare*).

Treated plants and untreated controls were maintained in a greenhouse for approximately 21 to 28 days, after which all treated plants were compared to untreated controls and visually evaluated. Plant response ratings, summarized in Table G, are based upon a 0 to 100 scale where 0 is no effect and 100 is complete control. A dash response (-) means no test result.

Table G	COMPOUND	
Rate 250 g/ha	20	24
POSTEMERGENCE		
Annual bluegras	60	50
Barley (winter)	50	10
Blackgrass (2)	30	30
Blk nightshade	95	100
Chickweed	90	65
Common poppy	100	70
Deadnettle	95	70
Downy brome	40	20
Field violet	100	100
Galium (2)	60	65
Green foxtail	85	95
I. Ryegrass	20	20
Jointed goatgra	30	30
Kochia	75	70
Lambsquarters	100	75
LS canarygrass	65	30
Rape (1)	100	100
Redroot pigweed	75	70
Russian thistle	80	65
Scentless chamo	100	75

Table G	COMPOUND					
Rate 250 g/ha	20	25	29	36	37	57
PREEMERGENCE						
Alfalfa	-	-	-	-	-	-
Annual bluegras	100	90	85	85	100	75
Barley (winter)	30	10	30	20	10	5
Blackgrass (2)	90	70	50	100	70	30
Blk nightshade	100	100	100	100	100	100
Chickweed	85	85	100	100	100	70
Common poppy	100	100	100	100	100	100
Deadnettle	70	70	100	85	70	-
Downy brome	100	85	20	100	100	30
Field violet	100	100	85	50	100	60
Galium (2)	100	100	85	100	100	100
Green foxtail	100	100	100	100	100	100
I. Ryegrass	75	65	65	100	100	10
Jointed goatgra	65	40	20	90	65	10
Kochia	85	100	100	100	100	100
Lambsquarters	75	85	70	85	70	70
Lentil	-	-	-	-	-	-
LS canarygrass	100	65	85	75	70	70
Pea	-	-	-	-	-	-
Potato	-	-	-	-	-	-

Spring Barley	30	10	Rape (1)	90	100	85	85	75	100
Sugar beet	100	100	Redroot pigweed	100	85	100	100	85	75
Sunflower	60	60	Russian thistle	100	85	100	100	100	60
Veronica hedera	-	70	Scentless chamo	85	70	85	85	70	75
Wheat (spring)	30	15	Sorghum	-	-	-	-	-	-
Wheat (winter)	20	10	Spring Barley	20	10	10	20	20	10
Wild buckwheat	55	70	Sugar beet	100	100	100	100	100	70
Wild mustard	100	100	Sunflower	30	80	35	60	80	10
Wild oat (1)	45	30	Veronica hedera	100	100	100	100	100	-
Windgrass	60	60	Wheat (spring)	30	10	10	40	30	10
			Wheat (winter)	20	10	10	20	30	5
			Wild buckwheat	100	90	100	100	100	100
			Wild mustard	100	100	100	100	100	100
			Wild oat (1)	90	60	75	85	90	20
			Windgrass	100	100	85	100	70	100

Table G	COMPOUND								
Rate 125 g/ha	6	13	14	20	21	22	49	51	56
POSTEMERGENCE									
Annual bluegras	20	50	60	40	50	70	50	30	65
Barley (winter)	10	10	20	40	20	65	10	60	10
Blackgrass (2)	10	10	20	20	20	60	25	20	20
Blk nightshade	80	100	100	100	75	90	100	70	100
Chickweed	30	65	60	85	50	70	100	60	70
Common poppy	50	85	100	100	70	100	100	70	100
Deadnettle	30	85	100	100	45	100	100	60	80
Downy brome	10	20	20	30	10	70	20	10	30
Field violet	100	100	100	100	50	95	100	80	90
Galium (2)	30	80	55	60	50	80	85	70	65
Green foxtail	55	70	60	60	15	70	65	30	50
I. Ryegrass	10	10	30	20	5	70	20	20	20
Jointed goatgra	15	20	20	20	10	40	20	30	20
Kochia	80	65	65	70	50	70	85	60	70
Lambsquarters	55	100	85	75	30	95	90	50	80
LS canarygrass	10	50	65	40	30	70	55	40	65
Rape (1)	70	100	100	100	95	90	100	50	85
R droot pigweed	100	90	75	85	75	95	95	50	80
Russian thistle	55	80	70	75	50	60	75	40	75

Scentless chamo	10	70	60	100	70	95	100	30	50
Spring Barley	20	20	20	20	20	60	10	40	10
Sugar beet	100	100	100	100	60	95	100	70	100
Sunflower	10	30	30	45	30	60	35	50	20
Veronica hedera	55	98	90	-	80	100	100	70	70
Wheat (spring)	10	20	30	20	10	60	10	30	10
Wheat (winter)	10	10	10	20	10	50	10	30	10
Wild buckwheat	40	40	50	80	70	50	65	40	45
Wild mustard	100	98	100	80	75	100	100	100	85
Wild oat (1)	10	20	20	30	20	90	20	30	10
Windgrass	10	50	50	30	20	50	50	20	50

Table G	COMPOUND																	
Rat 125 g/ha	6	12	13	14	16	20	21	22	24	25	29	36	37	49	51	56	57
PREEMERGENCE																		
Alfalfa	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Annual bluegras	75	100	85	70	50	100	60	85	70	80	85	100	100	85	35	100	70
Barl y (winter)	0	25	30	30	15	20	0	20	15	10	20	10	10	20	5	10	5
Blackgrass (2)	10	75	60	40	50	85	50	40	50	55	50	70	60	50	15	30	20
Blk nightshade	10	100	100	100	40	100	10	40	65	85	100	90	100	100	30	100	80
Chickweed	50	85	85	70	75	75	30	100	75	85	100	100	100	85	20	100	65
Common poppy	-	-	100	100	100	100	100	100	100	100	100	100	100	100	60	100	100
D adnettle	85	85	70	70	70	85	-	75	70	70	75	70	90	100	40	-	-
Downy brome	10	100	50	60	40	80	10	30	55	65	10	100	100	50	0	10	20
Fi ld violet	80	85	85	85	70	100	10	85	85	85	85	65	100	100	85	100	60
Galium (2)	30	100	100	100	100	100	30	70	100	100	100	100	100	-	70	100	100
Green foxtail	60	100	100	75	100	100	60	100	100	100	100	100	100	100	80	100	85
I. Ryegrass	20	100	50	50	50	75	45	15	20	30	30	100	70	30	10	20	10
Jointed goatgra	10	55	30	45	30	60	0	15	30	30	10	50	35	20	10	30	5
Kochia	85	-	85	75	65	75	5	60	90	70	70	100	100	70	60	70	100
Lambsquarters	10	70	85	70	75	75	50	85	70	70	70	75	70	70	70	70	70
L ntil	-	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LS canarygrass	10	100	65	85	40	100	60	65	40	60	100	75	100	85	20	100	60
Pea	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potato	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Rape (1)	10	85	90	85	70	85	10	60	65	85	85	85	85	100	20	100	90
Redroot pigweed	85	100	85	85	75	100	50	100	70	70	70	70	70	85	70	70	75
Russian thistle	0	100	50	50	40	80	0	20	60	65	60	100	100	100	10	100	50
Scentless chamo	55	-	-	-	100	100	-	-	70	70	70	70	70	85	-	75	70
Sorghum	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spring Barley	0	20	20	50	20	10	0	20	10	10	10	10	10	20	10	10	5
Sugar beet	-	100	100	85	100	100	40	100	100	100	100	100	100	100	60	85	75
Sunflower	0	30	20	20	20	25	0	20	30	60	50	50	60	15	10	10	10
Veronica hedera	60	100	100	100	100	100	60	100	100	100	100	100	100	-	100	-	-
Wheat (spring)	10	25	20	30	20	10	0	10	10	10	2	30	30	20	5	20	5
Wheat (winter)	0	20	20	40	10	10	0	20	10	0	2	20	10	10	10	10	2
Wild buckwheat	10	75	100	85	55	80	40	60	60	85	85	95	100	100	30	85	85
Wild mustard	50	100	100	100	100	100	80	85	100	100	100	100	100	100	100	85	85
Wild oat (1)	10	75	50	50	55	85	30	60	60	50	45	45	50	50	10	10	20
Windgrass	50	100	100	100	100	100	70	85	100	100	85	100	100	100	70	75	75

Table G	COMPOUND											
Rate 62 g/ha	12	13	14	20	21	22	49	50	51	52	56	57
POSTEMERGENCE												
Annual bluegras	30	20	30	20	20	50	30	50	20	50	60	60
Barley (winter)	10	10	10	30	30	60	10	40	50	50	10	10
Blackgrass (2)	10	10	10	20	10	40	20	30	20	40	20	20
Blk nightshade	100	85	100	100	75	90	100	60	90	80	100	90
Chickweed	55	60	60	70	30	75	70	30	40	60	60	50
Common poppy	100	60	100	85	40	100	100	70	30	80	100	50
Deadnettle	100	85	80	85	30	100	100	70	60	70	80	65
Downy brome	10	10	20	15	5	30	10	0	10	30	10	10
Field violet	100	100	100	100	30	90	100	90	30	70	100	80
Galium (2)	65	50	50	55	20	70	65	30	50	70	60	55
Green foxtail	65	50	40	60	10	50	50	20	20	60	65	50
I. Ryegrass	10	10	10	10	2	20	15	20	20	20	10	5
Jointed goatgra	10	10	10	10	5	40	10	20	20	30	10	10
Kochia	70	60	55	65	30	70	75	70	60	60	70	85
Lambsquarters	85	100	80	85	30	90	90	80	50	80	80	65
LS canarygrass	20	20	30	30	20	60	30	40	30	40	60	25
Rape (1)	100	85	80	100	100	80	95	60	50	50	100	80
Redroot pigweed	85	65	60	80	70	95	90	90	50	95	70	80
Russian thistle	70	70	60	75	30	50	75	30	40	40	70	65
Scentless chamo	55	-	30	65	50	80	60	80	30	30	30	30
Spring Barley	10	10	10	10	10	50	10	40	30	40	10	10
Sugar beet	100	90	100	100	50	90	100	80	50	80	100	80
Sunflower	20	20	20	50	30	60	30	70	40	50	10	40
Veronica hedera	100	98	100	-	75	100	100	100	80	95	75	60
Wheat (spring)	10	10	20	10	10	50	10	30	30	30	10	15
Wheat (winter)	10	10	10	10	10	40	10	30	20	30	10	10
Wild buckwheat	40	40	30	80	45	50	40	30	40	50	60	50
Wild mustard	100	80	100	70	75	100	100	60	100	90	100	95
Wild oat (1)	20	10	10	20	20	70	15	20	30	50	10	10
Windgrass	20	20	20	30	10	30	30	20	20	30	30	30

Table G	COMPOUND																
Rate 62 g/ha	12	13	14	20	21	22	24	25	29	36	37	49	50	51	52	56	57
PREEMERGENCE																	
Alfalfa	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Annual bluegras	100	75	70	85	20	100	60	60	55	70	70	80	50	85	20	75	70
Barley (winter)	10	35	20	10	0	10	5	10	30	10	10	10	30	0	10	5	10
Blackgrass (2)	50	15	55	20	40	20	50	30	30	55	60	20	30	10	20	10	10
Blk nightshade	65	85	65	60	0	30	60	50	85	60	100	100	0	20	10	100	60
Chickweed	80	85	85	85	15	50	75	85	75	100	85	80	30	20	70	80	60
Common poppy	-	100	100	100	70	70	100	100	100	100	100	100	90	-	60	100	100
Deadnettle	75	70	85	100	-	85	60	55	70	85	85	100	100	30	10	-	-
Downy brome	65	30	50	55	20	20	30	50	40	85	50	25	50	5	5	20	5
Field violet	100	100	85	100	0	100	70	65	70	65	60	85	50	65	60	100	60
Galium (2)	100	100	100	100	0	60	100	100	100	100	100	-	40	-	40	100	100
Green foxtail	100	100	60	100	50	100	85	100	100	100	100	100	80	35	100	100	10
I. Ryegrass	10	30	30	50	10	10	20	30	20	85	65	55	0	10	10	10	5
Jointed goatgra	20	20	10	-	5	-	30	30	10	30	35	10	20	0	10	5	0
Kochia	-	70	40	70	5	50	55	100	65	100	100	60	30	30	60	60	50
Lambsquarters	70	65	65	70	30	65	70	70	70	70	70	70	80	60	85	100	70
Lentil	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LS canarygrass	100	20	60	75	20	45	30	50	20	65	60	85	40	40	30	30	50
Pea	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potato	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Rape (1)	80	100	65	80	10	55	65	75	80	85	85	85	30	10	40	100	100
Redroot pigweed	100	100	85	70	0	85	70	70	70	70	-	100	90	-	100	100	70
Russian thistle	100	20	20	60	0	10	30	30	70	100	50	35	20	5	0	50	30
Scentless chamo	70	-	-	80	-	-	70	70	70	70	70	60	90	-	-	70	70
Sorghum	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spring Barley	20	10	10	10	0	10	5	10	10	5	10	20	0	5	5	10	2
Sugar beet	100	100	85	100	50	50	100	100	85	100	100	100	30	55	60	30	85
Sunflower	50	20	10	15	10	10	20	55	50	35	60	20	30	5	10	5	0
Veronica hedera	100	100	100	100	50	70	100	100	100	100	100	-	-	100	100	-	-
Wheat (spring)	10	10	10	5	10	10	5	2	2	10	20	20	30	0	0	10	5
Wheat (winter)	10	20	30	10	5	10	5	0	5	20	20	10	10	0	5	5	0
Wild buckwheat	30	85	60	70	5	25	60	80	65	80	75	80	30	50	50	30	50
Wild mustard	100	100	70	100	55	80	85	100	85	100	100	100	80	60	70	85	70
Wild oat (1)	30	40	20	30	10	30	30	20	30	30	50	80	50	0	20	10	10
Windgrass	100	85	100	85	15	50	100	100	100	100	100	100	70	60	70	70	55

Table G	COMPOUND										
Rate 31 g/ha	13	14	20	21	22	49	50	51	52	56	57
POSTEMERGENCE											
Annual bluegras	10	20	15	20	30	20	50	10	30	50	50
Barley (winter)	10	10	20	10	60	10	40	50	50	10	10
Blackgrass (2)	10	10	10	10	20	10	30	10	30	10	10
Blk nightshade	100	75	100	70	90	100	60	70	90	75	80
Chickweed	50	50	55	45	70	60	10	40	60	60	50
Common poppy	50	85	85	30	100	100	50	20	60	85	50
Deadnettle	85	60	80	30	70	85	60	60	40	75	60
Downy brome	10	20	10	2	30	10	0	10	20	10	5
Field violet	100	100	100	10	80	100	60	30	50	70	70
Galium (2)	40	40	50	20	50	70	40	30	50	60	50
Green foxtail	30	10	30	10	30	10	0	20	30	30	60
I. Ryegrass	10	10	10	0	20	10	0	20	20	10	5
Jointed goatgra	10	10	10	2	30	10	20	20	30	10	10
Kochia	50	50	60	20	60	75	50	60	60	60	60
Lambsquarters	100	85	80	0	70	100	50	30	70	75	65
LS canarygrass	10	20	20	10	40	10	40	20	30	55	20
Rape (1)	85	55	100	60	60	75	60	20	50	70	65
Redroot pigweed	55	50	70	60	90	85	50	20	80	70	70
Russian thistle	60	50	70	20	40	60	20	20	30	60	70
Scentless chamo	30	20	70	0	70	50	80	20	20	10	10
Spring Barley	10	10	15	5	40	10	50	30	40	10	10
Sugar beet	65	55	100	30	60	75	100	40	70	98	98
Sunflower	15	20	30	30	30	20	50	20	30	20	30
Veronica hedera	100	98	-	70	100	100	50	70	90	70	55
Wheat (spring)	10	10	10	5	40	10	20	10	20	10	10
Wheat (winter)	10	10	10	5	30	10	30	10	30	10	5
Wild buckwheat	30	20	30	30	50	40	45	20	50	40	55
Wild mustard	60	70	100	60	100	95	40	70	90	90	95
Wild oat (1)	10	10	10	30	60	10	0	20	40	20	10
Windgrass	10	10	20	10	30	20	20	10	20	20	20

Table G		COMPOUND													
Rate 31 g/ha	12	13	14	16	20	21	22	24	36	37	49	50	51	52	56
PREEMERGENCE															
Alfalfa	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Annual bluegras	100	55	60	30	60	10	50	50	50	60	75	40	10	10	40
Barley (winter)	10	10	10	5	5	10	5	5	10	0	20	0	0	5	2
Blackgrass (2)	30	10	10	20	10	30	10	30	20	50	10	30	5	10	10
Blk nightshade	35	60	50	20	50	0	20	50	60	50	60	0	10	5	60
Chickweed	75	85	70	70	60	10	20	70	85	70	85	0	30	30	85
Common poppy	-	85	100	100	100	65	60	100	100	100	100	90	25	20	100
Deadnettle	30	70	60	60	85	-	30	70	55	65	85	50	20	5	-
Downy brome	20	40	30	15	10	10	10	20	50	50	10	50	0	0	0
Field violet	50	70	70	70	70	50	50	60	10	50	60	30	70	65	30
Galium (2)	100	100	70	70	100	0	50	60	100	60	-	0	10	20	100
Green foxtail	100	55	50	100	100	30	50	100	100	100	100	40	10	55	60
I. Ryegrass	20	20	45	10	20	20	10	20	10	30	10	0	0	5	20
Jointed goatgra	10	10	20	10	10	0	0	10	20	20	5	20	0	5	10
Kochia	-	65	30	60	60	0	30	50	100	100	55	20	10	50	50
Lambsquarters	65	70	65	70	55	60	30	70	60	65	70	30	50	100	100
Lentil	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LS canarygrass	100	20	30	20	20	10	15	20	-	60	75	50	5	20	20
Pea	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potato	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rape (1)	65	50	10	60	50	0	30	60	60	100	65	0	10	20	100
Redroot pigweed	80	70	85	70	75	30	60	70	-	65	100	90	50	65	100
Russian thistle	100	30	10	20	30	5	0	20	20	30	20	0	0	0	10
Scentless chamo	-	-	-	70	70	-	-	100	60	70	70	50	-	-	10
Sorghum	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spring Barley	10	10	10	2	5	0	10	2	10	10	10	0	2	5	5
Sugar beet	100	85	70	60	65	30	35	90	100	100	100	30	10	50	45
Sunflower	20	0	10	40	10	10	0	0	25	55	10	30	0	5	5
Veronica hedera	100	100	100	70	100	50	100	100	100	100	-	-	65	100	-
Wheat (spring)	5	5	20	10	0	0	5	2	10	10	10	10	0	0	10
Wheat (winter)	5	5	20	0	5	0	5	2	10	0	0	0	10	0	0
Wild buckwheat	20	65	55	30	60	0	10	35	60	65	50	30	20	10	40
Wild mustard	100	85	65	100	85	40	60	70	100	100	100	60	50	55	100
Wild oat (1)	20	20	30	20	10	20	10	20	20	20	30	50	0	10	10
Windgrass	100	50	100	100	55	50	45	80	100	100	100	50	30	60	50

Table G	COMPOUND
Rate 16 g/ha	52
POSTEMERGENCE	
Annual bluegras	20
Barley (winter)	40
Blackgrass (2)	20
Blk nightshade	90
Chickweed	60
Common poppy	40
Deadnettle	20
Downy brome	10
Field violet	30
Galium (2)	20
Green foxtail	30
I. Ryegrass	0
Jointed goatgra	20
Kochia	50
Lambsquarters	30
LS canarygrass	30
Rape (1)	30
Redroot pigweed	30
Russian thistle	10
Scentless chamo	0
Spring Barley	30
Sugar beet	50
Sunflower	20
Veronica hedera	80
Wheat (spring)	10
Wheat (winter)	30
Wild buckwheat	60
Wild mustard	70
Wild oat (1)	30
Windgrass	10

Table G	COMPOUND			
Rate 16 g/ha	12	52	56	57
PREEMERGENCE				
Alfalfa	50	-	-	-
Annual bluegras	30	5	20	10
Barley (winter)	5	0	5	10
Blackgrass (2)	50	5	5	0
Blk nightshade	30	2	30	35
Chickweed	10	0	75	50
Common poppy	-	65	60	100
Deadnettle	20	0	65	30
Downy brome	10	10	5	5
Field violet	20	10	5	0
Galium (2)	60	10	40	30
Green foxtail	60	50	60	30
I. Ryegrass	10	0	5	5
Jointed goatgra	5	0	10	0
Kochia	-	30	50	10
Lambsquarters	15	30	70	65
Lentil	10	-	-	-
LS canarygrass	10	5	20	5
Pea	5	-	-	-
Potato	0	-	-	-
Rape (1)	55	10	85	65
Redroot pigweed	70	55	70	40
Russian thistle	85	0	50	10
Scentless chamo	-	-	0	20
Sorghum	5	-	-	-
Spring Barley	5	0	10	0
Sugar beet	100	10	40	65
Sunflower	10	0	10	10
Veronica hedera	100	100	100	100
Wheat (spring)	5	0	0	0
Wheat (winter)	0	0	0	0
Wild buckwheat	10	0	30	20
Wild mustard	100	45	100	50
Wild oat (1)	10	15	5	0
Windgrass	100	45	10	10

Table G COMPOUND	
Rate 8 g/ha	12
PREEMERGENCE	
Alfalfa	50
Annual bluegras	-
Barley (winter)	5
Blackgrass (2)	-
Blk nightshade	-
Chickweed	-
Common poppy	-
Deadnettle	-
Downy brome	-
Field violet	-
Galium (2)	-
Green foxtail	-
I. Ryegrass	-
Jointed goatgra	-
Kochia	-
Lambsquarters	-
Lentil	5
LS canarygrass	-
Pea	5
Potato	0
Rape (1)	10
Redroot pigweed	-
Russian thistle	-
Scentless chamo	-
Sorghum	2
Spring Barley	5
Sugar beet	10
Sunflower	0
Veronica hedera	-
Wheat (spring)	0
Wheat (winter)	0
Wild buckwheat	-
Wild mustard	-
Wild oat (1)	-
Windgrass	-

Table G COMPOUND	
Rate 4 g/ha	12
PREEMERGENCE	
Alfalfa	20
Annual bluegras	-
Barley (winter)	0
Blackgrass (2)	-
Blk nightshade	-
Chickweed	-
Common poppy	-
Deadnettle	-
Downy brome	-
Field violet	-
Galium (2)	-
Green foxtail	-
I. Ryegrass	-
Jointed goatgra	-
Kochia	-
Lambsquarters	-
Lentil	0
LS canarygrass	-
Pea	10
Potato	0
Rape (1)	20
Redroot pigweed	-
Russian thistle	-
Scentless chamo	-
Sorghum	0
Spring Barley	0
Sugar beet	15
Sunflower	0
Veronica hedera	-
Wheat (spring)	0
Wheat (winter)	0
Wild buckwheat	-
Wild mustard	-
Wild oat (1)	-
Windgrass	-

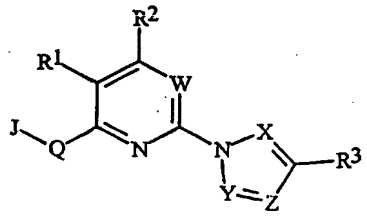
Table G COMPOUND	
Rate 2 g/ha	12
PREEMERGENCE	
Alfalfa	30
Annual bluegras	-
Barley (winter)	0
Blackgrass (2)	-
Blk nightshade	-
Chickweed	-
Common poppy	-
Deadnettle	-
Downy brome	-
Field violet	-
Galium (2)	-
Green foxtail	-
I. Ryegrass	-
Jointed goatgra	-
Kochia	-
Lambsquarters	-
Lentil	0
LS canarygrass	-
Pea	0
Potato	0
Rape (1)	10
Redroot pigweed	-
Russian thistle	-
Scentless chamo	-
Sorghum	0
Spring Barley	0
Sugar beet	0
Sunflower	0
Veronica hedera	-
Wheat (spring)	0
Wheat (winter)	0
Wild buckwheat	-
Wild mustard	-
Wild oat (1)	-
Windgrass	-

Table G COMPOUND			
Rate 1 g/ha	12	Lentil	0
PREEMERGENCE		LS canarygrass	-
Alfalfa	5	Pea	0
Annual bluegras	-	Potato	0
Barley (winter)	0	Rape (1)	0
Blackgrass (2)	-	Redroot pigweed	-
Blk nightshade	-	Russian thistle	-
Chickweed	-	Scentless chamo	-
Common poppy	-	Sorghum	0
Deadnettle	-	Spring Barley	0
Downy brome	-	Sugar beet	0
Field violet	-	Sunflower	0
Galium (2)	-	Veronica hedera	-
Green foxtail	-	Wheat (spring)	0
I. Ryegrass	-	Wheat (winter)	0
Jointed goatgra	-	Wild buckwheat	-
Kochia	-	Wild mustard	-
Lambsquarters	-	Wild oat (1)	-
		Windgrass	-

CLAIMS

What is claimed is:

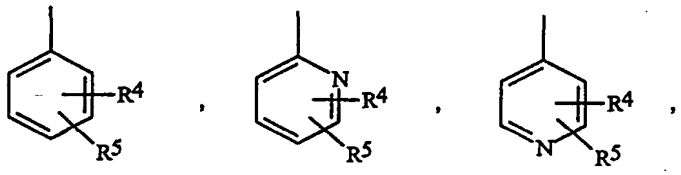
1. A compound selected from Formula I, geometric or stereoisomers thereof, *N*-oxides thereof, and agriculturally suitable salts thereof,



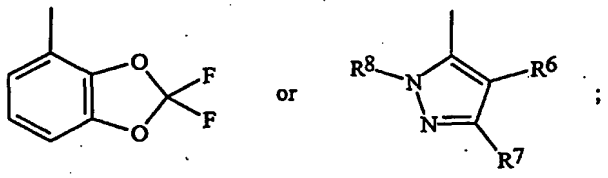
I

wherein

J is



J-1 J-2 J-3



J-4 or J-5 ;

W is N or CR^9;

X, Y and Z are independently N, CH or CR^9, provided that only one of X, Y and Z is CR^9;

Q is O, $S(O)_n$ or NR^{10};

R^1 and R^2 are independently H, halogen, cyano, C_1-C_4 alkoxy, C_1-C_4 haloalkoxy, C_2-C_4 alkoxyalkyl, C_3-C_5 dialkoxyalkyl, C_1-C_4 alkyl, C_1-C_4 haloalkyl, C_2-C_4 alkoxyalkyl, C_3-C_4 alkenyl, C_3-C_4 alkynyl, C_3-C_4 alkenyloxy, C_3-C_4 alkynyloxy, $S(O)_nR^8$, C_2-C_4 alkylthioalkyl, C_2-C_4 alkylsulfonylalkyl, C_1-C_4 alkylamino or C_2-C_4 dialkylamino;

R^3 is H, halogen, cyano, C_1-C_4 alkoxy, C_1-C_4 haloalkoxy, C_1-C_4 haloalkyl, C_2-C_4 alkoxyalkyl, C_3-C_4 alkenyl, C_3-C_4 alkynyl, C_3-C_4 alkenyloxy, C_3-C_4 alkynyloxy or $S(O)_nR^8$;

R^4 is halogen, cyano, SF_5, C_1-C_4 haloalkyl, C_1-C_4 alkoxy, C_1-C_4 haloalkoxy or $S(O)_nR^8$;

R^5 is H, halogen, cyano, SF_5, C_1-C_4 haloalkyl, C_1-C_4 alkoxy, C_1-C_4 haloalkoxy or $S(O)_nR^8$;

R^6 is H, halogen, cyano, SF_5, C_1-C_4 haloalkyl, C_1-C_4 alkoxy, C_1-C_4 haloalkoxy or $S(O)_nR^8$;

R^7 is halogen, cyano, SF_5, C_1-C_4 haloalkyl, C_1-C_4 alkoxy, C_1-C_4 haloalkoxy or $S(O)_nR^8$;

each R^8 is independently C_1-C_4 alkyl or C_1-C_4 haloalkyl;

each R^9 is independently halogen, cyano, C_1-C_4 alkoxy, C_1-C_4 haloalkoxy, C_1-C_4 alkyl, C_1-C_4 haloalkyl, C_2-C_4 alkoxyalkyl, C_3-C_4 alkenyl, C_3-C_4 alkynyl, C_3-C_4 alkenyloxy, C_3-C_4 alkynyloxy or $S(O)_nR^8$;

R^{10} is H, C_1-C_4 alkyl or C_1-C_4 haloalkyl; and

each n is independently 0, 1 or 2.

2. A compound of Claim 1 wherein:

Q is O;

R^1 and R^2 are independently H, C_1-C_4 alkyl or C_1-C_4 alkoxy; and

R^3 is halogen, C_1-C_4 haloalkyl, C_1-C_4 haloalkoxy or C_1-C_4 haloalkylthio.

3. A compound of Claim 2 wherein:

W is N;

Y is CR^9; and

R^5 is H.

4. A compound of Claim 3 wherein:

R^2 is H; and

each R^4 is independently halogen, C_1-C_4 haloalkyl, C_1-C_4 haloalkoxy or C_1-C_4 haloalkylthio.

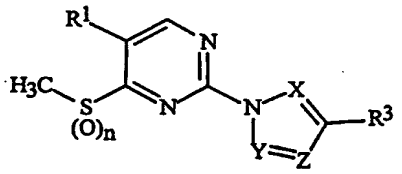
5. The compound of Claim 4 which is selected from the group:

(a) 5-methyl-4-[3-(trifluoromethyl)phenoxy]-2-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]pyrimidine;

(b) 4-[3-(trifluoromethyl)phenoxy]-2-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]pyrimidine;

(c) 5-methyl-4-[3-(trifluoromethoxy)phenoxy]-2-[4-(trifluoromethyl)-1*H*-imidazol-1-yl]pyrimidine;
(d) 5-methyl-2-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]-4-[[6-(trifluoromethyl)-2-pyridinyl]oxy]pyrimidine;
(e) 5-methyl-4-[3-(trifluoromethyl)phenoxy]-2-[3-(trifluoromethyl)-1*H*-1,2,4-triazol-1-yl]pyrimidine;
(f) 5-methyl-2-[4-(trifluoromethyl)-1*H*-imidazol-1-yl]-4-[3-(trifluoromethyl)phenoxy]pyrimidine;
(g) 5-ethyl-4-[3-(trifluoromethyl)phenoxy]-2-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]pyrimidine;
(h) 5-ethyl-4-[3-(trifluoromethoxy)phenoxy]-2-[3-(trifluoromethyl)-1*H*-pyrazol-1-yl]pyrimidine;
(i) 5-ethyl-2-[4-(trifluoromethyl)-1*H*-imidazol-1-yl]-4-[3-(trifluoromethyl)phenoxy]pyrimidine; and
(j) 5-ethyl-4-[3-(trifluoromethoxy)phenoxy]-2-[4-(trifluoromethyl)-1*H*-imidazol-1-yl]pyrimidine.

6. A compound selected from Formula 1a and agriculturally suitable salts thereof,



1a

wherein
X, Y and Z are independently N, CH or CR^9, provided that only one of X, Y and Z is CR^9;
R^1 is H, C_1-C_4 alkyl or C_1-C_4 alkoxy;
R^3 is halogen, C_1-C_4 haloalkyl, C_1-C_4 haloalkoxy or C_1-C_4 haloalkylthio;
each R^9 is independently halogen or cyano; and
n is 0, 1 or 2.

7. A compound of Claim 6 wherein
R^1 is C_1-C_4 alkyl; and
R^3 is C_1-C_4 haloalkyl or C_1-C_4 haloalkoxy.

8. A herbicidal composition comprising a herbicidally effective amount of a compound of Claim 1 and at least one of a surfactant, a solid diluent or a liquid diluent.

9. A method for controlling the growth of undesired vegetation comprising contacting the vegetation or its environment with a herbicidally effective amount of a compound of Claim 1.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 98/04600

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 C07D403/04 C07D401/04 C07D401/14 C07D405/14 C07D403/14
A01N43/56 A01N43/54 A01N43/50 A01N43/40
//(C07D403/04,239:00,231:00),(C07D401/04,231:00,213:00)

According to International Patent Classification(IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 C07D A01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 723 960 A (AMERICAN CYANAMID CO) 31 July 1996 see claims 1-4,7 ---	1-9
Y	EP 0 572 093 A (SHELL INT RESEARCH) 1 December 1993 see claims 1-7,10 ---	1-9
Y	DATABASE WPI Week 9615 Derwent Publications Ltd., London, GB; AN 96-151315 XP002071053 & WO 96 06096 A (NISSAN CHEM. IND., LTD.) , 29 February 1996 cited in the application see abstract --- -/--	1-9

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 July 1998	21/07/1998

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 98/04600

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 216 360 A (SCHERING AG) 1 April 1987 see claims 1,3	1-9
A	DE 29 35 578 A (HOKKO CHEM IND CO) 2 April 1981 see abstract; table 1	1-9
A,P	WO 98 04550 A (AMERICAN CYANAMID CO) 5 February 1998 see abstract	1-9

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/US 98/04600

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0723960 A	31-07-1996	AU 4216496 A	01-08-1996
		CA 2167982 A	27-07-1996
		CN 1143078 A	19-02-1997
		CZ 9600175 A	14-08-1996
		HU 9600161 A	28-02-1997
		JP 8277268 A	22-10-1996
		SG 33666 A	18-10-1996
		SK 10996 A	10-09-1997
EP 0572093 A	01-12-1993	BR 9302077 A	30-11-1993
		CN 1079220 A	08-12-1993
		JP 6040813 A	15-02-1994
		US 5374604 A	20-12-1994
EP 0216360 A	01-04-1987	DE 3534391 A	02-04-1987
		DE 3605343 A	20-08-1987
		AU 589685 B	19-10-1989
		AU 6312486 A	26-03-1987
		BR 8604598 A	26-05-1987
		DK 455886 A	25-03-1987
		FI 863833 A	25-03-1987
		JP 62123185 A	04-06-1987
		SU 1560052 A	23-04-1990
		US 4891428 A	02-01-1990
		US 4776876 A	11-10-1988
DE 2935578 A	02-04-1981	NONE	
WO 9804550 A	05-02-1998	AU 3816997 A	20-02-1998